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Pacific Biological Station
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Fisheries and Marine Service

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JUVENILE SALMON IN THE NANAIMO AREA 1975:

2. LENGTH, WEIGHT, AND GROWTH

by

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ABSTRACT

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This report documents the size and seasonal changes in size of chum and chinook fry captured in the Nanaimo area in 1975. Chum fry, migrating downstream in the Nanaimo River averaged 36 mm fork length (0.41 g). Fry captured on the Nanaimo River mud flat and on beaches some distance from the river mouth averaged only slightly larger than downstream migrants in size, however, there were more large fish among the catches away from the river mouth than in catches on the mud flat. Fry captured in 4-10 m of water or in >20 m were progressively larger on average, although catches still contained a significant number of small fish. Average size of fry captured in shallow water increased only slightly with season, but the size of fry captured away from shore increased rapidly in size after mid May, and fry captured over deep water during the first week of July (the last week of sampling) averaged 88.8 mm fork length (7.54 g).

Chinook fry migrating downstream in the Nanaimo River averaged 38 mm fork length (0.57 g). Chinook fry remained on the Nanaimo River mud flat until they reached a length of about 70 mm when they apparently moved seaward, and contributed to catches in June and July.

Length frequency histograms for chum captured by different gear each week were often asymetrical or multimodal. A possible explanation for this is that sampling was inadequate and did not truly represent population structure each week.

Growth rate of marked chum fry averaged greater than 5% of body weight per day for 5 different mark series. Fry migrating midway through the run grew most rapidly, but differences between marked groups were small.

RÉSUMÉ

Healey, M. C., R. V. Schmidt, F. P. Jordan, and R. M. Hungar. 1977. Juvenile salmon in the Nanaimo Area 1975: 2. Length, weight, and growth. Fish. Mar. Serv. MS Rep. 1438: 147 p.

Le présent rapport porte sur la taille des alevins et sur ses variations saisonnières chez les saumons kéta et quinnat capturés dans la region de Nanaimo, en 1975. La longueur moyenne à la fourche des alevins kéta d'avalaison dans la rivière Nanaimo est de 36 mm (0, 41 g). Les alevins capturés sur la vasière littorale de cette rivière, ainsi que sur les plages à quelque distance de l'embouchure sont, en moyenne, légèrement plus gros.

Toutefois, il y a plus de gros poissons parmi les prises effectuées loin de l'embouchure que parmi celles qui proviennent de la vasière. Les alevins capturés dans 4 à 10 m d'eau ou à des profondeurs de plus de 20 m ont une taille progressivement plus élevée, en moyenne, même si les prises contiennent toujours un nombre significatif de petits poissons. La taille moyenne des alevins capturés dans les eaux peu profondes n'augmente que très légèrement à mesure que la saison avance. Par contre, la taille des alevins capturés loin de la côte augmente rapidement après la mi-mai: les captures en eau profonde, effectuées durant la première semaine de juillet (derniere semaine d'échantillonnage), ont une longueur moyenne à fourche de 88,8 mm (7,54 g).

En moyenne, les alevins quinnat d'avalaison, dans la rivière Nanaimo, mesurent 38 mm (0,57 g) à la fourche. Ils restent sur la vasière littorale de la rivière jusqu'à ce qu'ils atteignent une longueur de 70 mm, après quoi il semble qu'ils migrent vers la mer pour apparaître dans les prises de juin et de juillet.

Les histogrammes de fréquence de la longueur des saumons kéta capturés chaque semaine au moyen de divers engins de pêche étaient souvent assymetriques ou multimodaux. Un échantillonnage inadéquat, ne représentant pas fidèlement la structure de la population à chaque semaine, constitute une explication possible de ce phénomène.

Le taux de croissance journalière des alevins kéta marqués s'élève à plus de 5 % du poids total et ce, pour cinq séries marquées. La taille des alevins qui ont migré au milieu de l'expérience a augmenté plus rapidement, mais les differences observées entre les groupes marqués sont minimes.

INTRODUCTION

In 1975 we began research on the population ecology of juvenile Pacific salmon (Oncorhynchus spp.) during the first few months after they enter the sea. Our research is part of a collaborative research project on the ecology of young salmon in the sea which is emphasizing interactions among young salmon, their food competitors and their predators (Healey et al. 1976a).

In 1975 our research centered on young salmon in the Nanaimo area, particularly chum (O. keta) fry from the Nanaimo River. Our objectives were to estimate the daily emigration of chum fry from the Nanaimo River, their distribution and abundance in the local area and the contribution of Nanaimo fry to the local population, their size and rate of growth, and their feeding habits. A previous report dealt with the distribution and abundance of young salmon in the Nanaimo area (Healey et al. 1977). This report presents information on size, condition, and growth of chum and chinook (O. tshawytscha) fry in the Nanaimo area in 1975.

METHODS

We described capture techniques, marking technique, sampling locations, and sample treatment in detail in the previous report (Healey et al. 1977), so we shall give only brief descriptions here. We captured chum and chinook fry during their downstream migration in the Nanaimo River by inclined plane traps set near the mouth of the river (Fig. 1). We operated the traps from early March to late May and collected daily samples of chum for measurement of length and weight. Chinook were much less abundant than chum and we took only occasional samples between the end of March and the beginning of May. We marked about 1% of the downstream migrants with fluorescent grit (Healey et al. 1976b), applying six different colours of grit to different segments of the run (Healey et al. 1977).

We sampled 23 different locations in the Nanaimo area for juvenile salmon from April until July (Fig. 1). We sampled by beach seine on the estuary (Areas 18, 19) and on beaches in other locations. We sampled water 4-10 m deep near shore with a 50-fm × 4-fm purse seine and deeper water (>20 m) with both a 120-fm × 14-fm purse seine and a 4-m two-boat trawl. We fished Areas 18 and 19 each week from early March until the end of May. We sampled Areas 1, 2, 4, 5, 8, 9, 15, and 16 (Fig. 1) by beach seine during May. We sampled Areas 1-17 by purse seine each week from April to July. We sampled Areas 2, 3, 5, 6, 7, 8, 9, 10, 12, and 13 monthly by trawl. We sampled Areas 21-24 by purse seine every 2 wk from late May to early July.

Each time we captured young chum we preserved a sample of 30-50 unmarked fry plus any recaptured marks. We sampled chinook catches less consistently and usually preserved no more than 15-20 per sample.

We measured the fork length of each fish to the nearest millimeter and the weight (preserved fish, blotted to remove excess moisture) to the nearest 0.01 g.

RESULTS

LENGTH AND WEIGHT OF FRY IN THE DOWNSTREAM RUN

Chum fry captured during the first 2 wk of the run were significantly ($P < 0.05$) larger than those captured during the remainder of the run (Table 1, Fig. 2). After Week 3 average lengths varied less than 1 mm and weight 0.02 g or less. These variations were not significant. The smallest and largest chum fry captured were 28 m, 0.22 g and 44 mm, 0.75 g, respectively. The range in the length and weight of chum fry captured each week declined throughout the run (Fig. 3). The average length and weight of chum fry was 36 mm and 0.41 g.

Chinook fry averaged 38.3 mm fork length and 0.57 g, slightly larger than chum fry. Chinook migrating during April were of constant size, but those migrating in early May were slightly smaller (Table 1). The range in length and weight of chinook each week did not decline as it did in chum. The smallest and largest chinook fry captured were 33 mm, 0.33 g, and 45 mm, 1.02 g, respectively.

Length and weight were significantly correlated in both chum and chinook migrants. For chum, the slope of the log length/log weight regression was 1.41 and for chinock the slope was 2.69 (Fig. 4, 5). The slope for chum is considerably less than the slope of approximately three expected for fishes, and suggests that the fry were growing on their yolk and body reserves and probably not feeding significantly in fresh water. The more usual length-weight relationship for chinook possibly indicates that feeding was initiated in fresh water before migration, although many of the fry captured were either recently buttoned or still had visible yolk.

Condition coefficient of chum fry ($K = 100L^3_{(cm)}/W_{(g)}$) ranged from 0.81 to 0.93 in weekly samples. Weekly variations were not statistically significant, nor was condition related to the size of fry. This last observation is inconsistent with the low slope of the length-weight regression for chum. If fry were in fact growing longer by burning body reserves and yolk, then the larger fry should have had a lower condition factor (Table 2).

We marked successive segments of the run with different colours of fluorescent grit (Healey et al. 1977). The next to last mark (blue/orange) tended to lose its blue component. These fish were only distinguishable from the last mark (green/orange) in recaptures from the mudflat (Areas 18, 19). We combined recaptures from this mark with the last series unless clearly blue/orange.

We released the first marked fry on Julian day 70 (March 11) and the last on Julian day 144 (May 24). The release of different marks extended over as many as 30 days (green/orange) and as few as 4 days (blue/orange) (Table 3). Further discussion of the different mark releases may be found in Healey et al. (1977). Fry marked at the start of the run (blue) were larger than average but the size of fry varied little among the remaining mark releases (Table 3).

We calculated the weighted average day of release for each mark as:

$$\bar{d} = \frac{\sum_{i} N_i d_i}{\sum_{i} N_i}$$

where: $\bar{d}$ is average day of release.
N_i is the number of marked fry released on day d_i (days are Julian day).

We shall use this weighted mean day of release in calculating average days at large for mark recaptures, and when calculating growth rate. For marks recaptured before the last release of the mark to which the recapture belongs, we calculated average day of release in the above manner using only releases up to the day prior to the recapture. In the case of green/orange marked fry the probable error in estimating days at large by comparing average release date and recapture date is large because marks were released over a long period of time (30 days).

LENGTH AND WEIGHT OF FRY CAPTURED ON THE MUD FLAT

We captured chum fry on the mud flat (Areas 18, 19) from the first week of sampling (March 9-16) until the 12th week of sampling (June 3-10) (Table 4). During the first week fry on the mud flat were of similar size to those in the downstream run (37.3 mm), but in all subsequent weeks the average size of fry captured on the mud flat was larger than the downstream migrants. The presence of larger fry on the mud flat after the first week indicates that at least some fry were residing and growing on the mud flat. Also, although fry were moving in the river when we began trapping in early March, substantial numbers had not yet moved downstream, since only small fry were present during the first week of sampling.

The smallest fry that we captured on the mud flat were always well below the average size of downstream migrants, and the average size of fry on the mud flat was never more than 12 mm longer and 0.65 g heavier than the average size of downstream migrants (Tables 1, 4). These observations indicate that, throughout our sampling, most of the fry on the mud flat were recent migrants.

The average size of fry on the mud flat increased slightly between March and June (Table 4), but the increase was considerably less than one would expect from the observed growth rate of fry. We interpret this to be further evidence for the preponderance of recent migrants in the mud-flat population throughout the sampling period.

Slopes of length-weight regressions for each weekly sample varied from 2.65-3.58 (Fig. 6-16). Slopes for Weeks 1 and 12 were significantly less than most other weeks, while those for Weeks 4, 5, and 11 were significantly greater than most other weeks. Slope and intercept were negatively correlated indicating rotation of the length-weight regression about some mean value rather than about the origin. For weeks with high slope, longer fish were heavier and shorter fish lighter than weeks with low slope.

Length-frequency histograms of weekly catches were either symmetrical (8 wk), skewed to the right (2 wk) or bimodal (1 wk) (Fig. 6-16). Fry from the early part of the run tended to reside on the mud flat while those from the latter part of the run spent little time on the mud flat (Healey et al. 1977). From this pattern of residence we would expect lengths in the first samples to be symmetrically distributed, those from the middle of the run skewed to the right and, in the latter part of the run, symmetrical again. In general this was the pattern; however, there was less skew than expected and the presence of a bimodal distribution was surprising.

Condition factor for chum fry on the mud flat ranged from 0.79-0.96 (Table 2). Condition did not vary significantly from week to week, nor was average condition related to the size of fry.

All six marks were represented in the catches from the mud flat (Table 4). The average length and weight of marked fry captured in successive weeks indicate rapid growth. When first recaptured marked fry were only slightly larger than the average size at release (36.5-39 mm, 0.40-0.51 g) while the last recapture of each mark ranged 41.8-53.8 mm and 0.68-1.79 g. Apart from the first mark (blue) the average size of fry from each mark series when last captured on the mud flat became progressively smaller with each succeeding mark. These results are consistent with shorter average residence time for later run fry noted in our previous report (Healey et al. 1977).

The first chinook fry that we captured on the mud flat were also of similar size to the downstream migrants (Table 5). The average size of chinook on the mud flat remained small until Week 8, after which chinook increased in size, averaging 58.4 mm and 2.47 g when sampling terminated in June (Table 5). The relative increase in weight of chinook fry on the mud flat was 3 times that of chums, suggesting a much longer residence of chinook on the mud flat. Mark returns for chinook suggested a similar residence time to chum (Healey et al. 1977), but we recovered only 11 marked chinook from the mud flat. The 11 marked chinook were generally of comparable size to the unmarked (Table 5).

LENGTH AND WEIGHT OF FRY CAPTURED BY BEACH SEINE IN THE NEARSHORE

Chum fry captured by beach seine in the nearshore during Weeks 10-12 ranged in size from 30-84 mm and 0.20-6.08 g (Table 6). In average length and weight they were comparable in size to fry captured on the mud flat at the same time. No fry from the mud flat exceeded 64 mm and 2.30 g; however, while fry larger than this were about 3% of beach seine catches in the nearshore.

In two of the nearshore beach seine samples (Area 5 - Week 12, Area 9 - Week 10) fry were significantly larger than those captured elsewhere at the same time (Table 6). These two areas are among the most distant sampling areas from the river; however, fry captured in these locations were not consistently larger than those captured closer to the river. As we shall show later, fry captured in these locations by other gear were, at times, also larger than average.

Slopes of length-weight regressions for these beach-seine samples ranged 3.28-2.91 (Fig. 17-19). Between Weeks 11 and 12 the change in slope (3.21-2.91) was significant and mimics a similar change in slope in samples from the mud flat (Fig. 15-16). Length-weight regressions for fry captured by beach seine in the nearshore were not significantly different from those for fry captured on the mud flat at the same time.

Length-frequency histograms for the beach-seine samples were all skewed to the right (Fig. 17-19), with modal size 36-38 mm, indicating a preponderance of recent downstream migrants in the catches together with a few fish that had been at sea for some time. Most of the recaptures in these samples were green/orange, a mark that was poorly represented on the mud flat. It seems likely that the fry in the shallow water nearshore at this time were chiefly later run fry which bypassed the mud flat to occupy nursery areas more distant from the river. The larger fish in the samples could be large emigrants from the mud flat or early migrants that also bypassed the mud flat area in favour of other nearshore nursery sites.

Green/orange marks occurred in all our nearshore beach-seine samples, and some red and green/orange marks recaptured by Mr. John Keyes in Area 17 were turned over to us. The green/orange marked fry captured in the nearshore beach seines were of similar size to those captured on the mud flat during the preceding weeks. We recaptured no marks from the mud flat during Weeks 11 and 12, so direct comparison cannot be made. The single red mark recaptured in Area 17 on Week 9 was of similar size to those recaptured from the mud flat at the same time.

LENGTH AND WEIGHT OF FRY CAPTURED BY 50-FM SEINE IN THE NEARSHORE

Chum fry first occurred in the 50-fm seine catches in the 8th week of sampling (April 27-May 3) in Mark Bay (Area 17) and Descanso Bay (Area 6), near to the mud flat, and in Locke Bay (Area 5), one of the areas most distant from the river. Fry captured during Week 8 were 33-57 mm in fork length and 0.3-1.66 g in weight (Table 7). By Week 11 chum fry were available to the 50-fm seine in most sampling areas, and at this time ranged in size from 32-84 mm fork length and 0.32-6.38 g. We continued to capture fry with the 50-fm seine until Week 18, by which time catches were small and sampling was terminated. On Week 18 the fry ranged in size from 53-111 mm fork length and 1.31-14.46 g (mean 64 mm, 3.79 g). The average size of fry captured in the 50-fm seine increased almost continuously throughout sampling (Table 7).

Fry captured by the 50-fm seine in the different locations were generally comparable in size except for those captured in False Narrows and Boat Harbour (Areas 8 and 9). The fry captured in these locations were generally significantly larger than those captured at the other locations, particularly early in the season (Table 7).

Length-weight regressions for weekly samples had slopes ranging from 3.01-3.36. In spite of this small variation all weekly regressions differed significantly from most other weeks. As with the weekly beach-seine samples, slope and intercept were negatively correlated, indicating rotation of the regression about some mean length-weight value, rather than rotation

about a fixed origin (Fig. 20-30). Length-frequency histograms for each weekly catch were bimodal or multimodal (5 wk), or skewed to the right (4 wk), seldom symmetrical (2 wk). Bimodal or multimodal length-frequency distributions were not simply a result of overlapping different individual distributions from particular areas. Most areas contributed to the mode at small size, while several areas contributed to modes at larger size.

Condition factor for fry captured by the 50-fm seine ranged from 0.87-1.00. Week-to-week changes in condition were not significant, nor were weekly values of condition for the 50-fm seine samples significantly different from values for fish captured by beach seine (Table 2).

We recovered mainly blue/orange and green/orange marks from the 50-fm seine samples. We recovered other marks mainly in Mark Bay (Area 17). When first recaptured the green/orange marks were consistently smaller than the unmarked fish, but as the season progressed they caught up to and surpassed the unmarked fish in size (Table 7). This suggests that significant recruitment of small fish occurred in the population after marking stopped on the Nanaimo River.

Chinook were abundant in the 50-fm seine catches mainly in June and July. They ranged in size from 68-175 mm fork length and 3.67-73.2 g, considerably larger than those captured on the mud flat a few weeks earlier. The average size of chinook in the seine catches did not show any consistent trend with time. Examination of a few scales from these fish indicated that the larger fish were yearlings, while the smallest were underyearlings, possibly from the Nanaimo estuary (Table 8).

LENGTH AND WEIGHT OF CHUM CAPTURED IN THE NEARSHORE BY 120-FM SEINE

Small numbers of fry were available to the 120-fm seine early in the season (Week 4). There was an early peak in catch by this gear in Week 8 that was not present in the 50-fm seine catch (Table 9). Chum fry captured in the 120-fm seine were small and constant in size, from Week 4 until Week 10 (37.7-42.5 mm average fork length, 0.45-0.79 g average weight, Table 9). After Week 10 the fry increased in size rapidly, and by Week 18 averaged 88.8 mm and 7.54 g.

Fry captured in the different sampling areas were generally of comparable size, although those from Snake Island (Area 4), False Narrows and Boat Harbour were often significantly larger than those captured elsewhere (Table 9).

Slopes of length-weight regressions for weekly samples taken by the 120-fm seine ranged from 2.97-3.5. Early catches were small so that the regressions are based on relatively few points. Most week-to-week differences were significant, although there were fewer differences among the early catches (Fig. 31-43).

Length-frequency histograms for weekly catches again show strong positive skew (8 wk), while distributions with obviously more than one mode were less common than in 50-fm seine catches (2 wk). Of the 13 weeks when we captured sufficient fish to plot a frequency distribution, only 2 wk had

symmetrical distributions, and 1 wk (Week 18) had a distribution skewed to the left (Fig. 31-43).

Comparing the frequency distributions from the data sets for each gear (Fig. 6-43) it is clear that distribution shapes do not correlate among the data sets. The proportion of symmetrical distributions declines from mud-flat beach seine to nearshore beach seine to 50-fm seine to 120-fm seine samples, while evidence of skew and bimodality (or multimodality) increases. The occurrence of positive skew is not surprising considering the skewed pattern of downstream migration and rapid growth in the sea. The range of sizes of fish in the samples also increases away from the river mouth and away from the beaches. It appears that small fish may occur anywhere, but large fish are found only in samples from deeper water. The movement of large fish into deeper water would tend to reduce the possibility of skew in samples from shallow water while increasing it in deeper water as observed.

Condition of chum captured each week by 120-fm seine ranged 0.81-1.03. Week-to-week changes were not significant, nor did fish captured in the 120-fm seine differ in condition from fish captured by some other method in the same week (Table 2). Although there were no apparent differences in condition of fry between gear types or between weeks within a gear type, overall the condition coefficients of fry from the mud flat and nearshore were significantly positively correlated with time. It seems doubtful that these changes can be a result of allometric growth since there were no systematic changes in the length-weight relationship with time. Fry appeared genuinely to improve in condition as the season progressed.

As with the 50-fm seine catches, most recaptures in the 120-fm seine catches were green/orange. Recaptured fry were of comparable size to unmarked fry, however, unlike the situation in the 50-fm seine catches.

Chinook captured in the 120-fm seine ranged from 72-330-mm fork length. Some of the largest fish captured returned to the water after measuring fork length, so we do not have weights for the larger fish (Table 10). Average size of chinook in the catches decreased with time. Size distributions suggest that fish captured up to Week 14 (mid-June) were mainly yearlings while those captured later included young-of-the-year also.

Chum fry captured by two-boat trawl were of comparable size to downstream migrants in Week 5 (the first week of sampling with this gear), but increased in size progressively until the last sampling period when they averaged 82.6 mm fork length and 6.26 g weight (Table 11).

CHANGES IN LENGTH AND WEIGHT WITH TIME AND LOCATION

Comparison of mean length and weight of fry captured on the mud flat and in various depth zones nearshore shows that early in the sampling there was no difference in the size of fry captured in the various locations (Fig. 44-45). Nor was there any obvious change in the average length or weight of fry in the catches until Week 9. After Week 9 fry from the mud flat and shallow nearshore waters remained small but those captured further offshore by the two purse seines and the trawl became rapidly larger in size. Those captured by the 50-fm seine were the first to show a rapid increase in size;

however, they were overtaken by the fry captured by the 120-fm seine and trawl in Week 13. After Week 13 fry captured by the 50-fm seine were always smaller than those captured by the 120-fm seine and the trawl.

The average length and weight of unmarked fry captured in different depths of water and distances from shore provide no clear picture of the possible influence of size in directing offshore movement. Recruitment of fry to the local population over several weeks and possible immigration of chum from adjacent rivers are likely to confound the picture. The green/orange marks, however, are a known subpopulation of Nanaimo River fish which were recruited over a relatively short time. Comparison of their size in different areas should provide a clearer indication of any relationship between size and movement away from shore. Green/orange marked fry captured in different depth zones by different gear types were all of comparable size, and none of the differences were statistically significant, although there was a tendency for those captured in the 50-fm seine to be larger than those captured in the 120-fm seine and trawl early in the season, and smaller later in the season (Fig. 46-47, Table 12).

GROWTH OF CHUM FRY

Apparent growth rates may be estimated in two ways. A crude, overall growth may be estimated from changes in the average size of fish in the population as a whole after recruitment of new fry has ended. Regressing length and $\log_e$ mean weight against time for the fry captured after Week 12 (the end of the Nanaimo River fry run) yields an estimate of growth of 0.56 mm per day or 2.4% of body weight per day. This estimate will be influenced by any continued recruitment of small fish to the area or emigration of large fish (resulting in an understanding of growth) and any mortality biased toward the small fish (resulting in an overestimate of growth). From the raw data it is not clear whether any of these biases dominate the data.

A second approach to the calculation of growth rates is to examine changes in the size of marked fish with time. The marked cohorts are of known age, within the error introduced by the time spent marking, and should provide a picture of the growth of different segments of the run. The marked cohorts also provide a preliminary comparison of the growth of fish captured in different parts of the study area.

All six mark series were represented in recaptures from the mud flat (Table 13). The average estimated number of days at large for the recaptures ranged from less than 1 day to more than 29 days. For the individual marked cohorts, the range of days at large was from less than 5 for green/orange marks to more than 24 for green. Returns were 30 or more fish from all the mark series except blue and blue/orange. All of the mark series were represented in the nearshore returns except for blue. Returns of series other than green/orange were few, however, (Table 14). Average days at large ranged from less than 3 to more than 52. The range of days at large is not less than 20 for any mark series, so that significant growth should be evident.

Blue/orange marks tended to lose their blue component and then appeared to be marked only with orange. Green/orange marks also sometimes lost their green component and then appeared only to be marked orange, but

to a much lesser extent than the blue/orange. Green/orange marks far outnumbered the blue/orange however. Recaptures marked with orange only and too small to be from the original orange only mark we classed as green/orange, but some of these could have been blue/orange. For these recaptures we calculated an average release date based on the combined blue/orange and green/orange releases.

We calculated separate regressions of $\log_e$ weight on days at large for each mark and for up to seven subdivisions within each series of recaptures (mud-flat recaptures; nearshore beach seine recaptures; 50-fm seine recaptures; 120-fm seine recaptures; two-boat trawl recaptures; nearshore recaptures combined; and nearshore and mud-flat recaptures combined) (Table 15). The average weight of downstream migrants was included as a data point in the regressions. The slowest rate of growth was shown by fry marked blue (2.73% per day) and the most rapid by green/orange returns from the mud flat (9.25%). Both curves are based on comparatively few points, however. For those curves based on 10 or more points the rates of growth range 4.7-6.43% per day.

The slopes of the regressions for the different areas do not present any clear picture of differences between sampling areas. From the apparent movement pattern of fry from mud flat to shallow nearshore to offshore we would expect the mud flat and shallow nearshore data to indicate slower growth than the offshore data. Although this pattern did occur it was not consistent. Also, although differences in the regression slope between areas were substantial, the differences were not statistically significant. It appears, therefore, that the best representation of growth for each group of marked fry is the regression using all the recaptures of that mark. All the marked groups apart from the first (blue) appear to have grown at a rate in excess of 5% per day. The data also suggest that the fish from the middle part of the run had the best growth (Table 15). The growth rates estimated from the mark returns may still be biased by emigration of large fish from the sample area (resulting in an underestimate of growth) and mortality biased toward the smaller fish (resulting in an overestimate). Unless size selective mortality is a dominant factor in the population, the results suggest that growth of chum fry is very rapid.

We also calculated regressions of length against time. For each mark we calculated separate regressions for recaptures from the mud flat, from the nearshore and for the combined recaptures (Table 16). Slopes for the mud flat recaptures were always less than slopes for the nearshore recaptures, in agreement with the observation that the larger fish move offshore. The regression slopes indicate that growth of the different marks ranged 0.43-1.07 mm per day, and, excluding the slow-growing blue marks, growth ranged 0.75-1.07 mm per day (Table 16). The slopes for growth in length differ significantly between marks, and again indicate better growth among the fry from the mid-part of the run.

DISCUSSION

The data on length and weight of chum fry corroborate our earlier conclusions about the migration pattern of the fry (Healey et al. 1977). The mud flat population of fry appears dominated by recent migrants, although some fry obviously spend long enough there to grow significantly. The same is probably true of the shallow nearshore, although our data are not sufficient to demonstrate this unequivocally.

Movement offshore was not restricted to large fish. Early in the season there was an offshore movement of a small group of recent migrants, and later on, when chum became generally available offshore, small fish were common in the catches. Large fish were, however, most common offshore. That movement offshore was related to size is also apparent in the comparison of average sizes in the catches by different gear in different depth zones. Early in the season, when recruitment from the river was still going on, fry were of similar average size in all depth zones. Later, although the fry in shallow water remained small, those captured offshore increased in size. Fry in the intermediate depth zone were largest at first but later those in the deepest zones were largest. The slower increase in size of fry captured in the intermediate depth zone relative to those captured offshore has two possible explanations: larger chum left the intermediate depth water and moved into deeper water, or small fry were continually recruited to the intermediate depth zone from shallow water but did not move into deeper water until they had grown significantly. Probably both these mechanisms are operating.

One point of inconsistency in this explanation is the presence of small fry both onshore and offshore in mid-season when the fry captured in the intermediate depths were first showing an increase in size. This could be further indication that certain fry from the Nanaimo system do not occupy the beaches but move offshore at once. This group appears to be a small component of the population and would be quickly swamped by the greater numbers of fish moving away from the beaches in early June.

The occurrence of larger than average fry in False Narrows, Boat Harbour, and Locke Bay could be interpreted as a gradual emigration of fish along shore as well as offshore. There was a slight tendency for fish captured further from the river mouth to be larger in size for both the 50-fm seine and 120-fm seine catches, but this was not sufficient to explain the presence of such large fish in Areas 8 and 9. Marked fish recaptured in these two areas were not larger than those captured at other locations. It is possible that the large fish were early migrants from some other system.

Apart from the downstream migrants, the slopes of length-weight regressions for all samples were in the range expected for salmonids. Most slopes were greater than three and many were significantly greater. Significant variations in slope from week to week, uncorrelated among gear types, are difficult to explain. These may have no biological meaning but may merely be differences in the response of samples to formaldehyde, or they may indicate that our sampling was not representative.

Variations in length-frequency distributions from week to week are both interesting and perplexing. They suggest considerable heterogeneity in the local population which was inadequately sampled by the gear we employed. A possible explanation for the fluctuating number of modes in the frequency distributions is that schools of chum in the local area were relatively large and size segregated, and that the purse seines sampled only a fraction of the selection of schools each week. The interpretation here, as with the length-weight regressions,is that our samples may not have been truly representative of the local population.

Growth rates calculated from the marked fish indicate that the differences in degree of utilization of the river delta by different segments of the run did not result in markedly different growth rates. Fry from the mid-part of the run appeared to have the best growth rates.

Growth in length and weight of chum fry were comparable with published growth rates for pink salmon during early sea life (LeBrasseur and Parker 1964), and within the observed capacity for growth of chum-fed natural foods (LeBrasseur 1969). The achievement of these growth rates implies excellent feeding conditions and a daily ration on the order of 18% body weight per day (LeBrasseur 1969).

The limited data on chinook indicate that some growth took place among the fry residing on the mud flat. We recaptured too few tagged chinook to permit an estimate of growth from marked fish. Away from the mud flat the population of chinook was dominated by large yearlings early in the season, but there was an influx of small fish in June and July which resulted in a marked increase in catch per set and a drop in the average size of the fish. Presumably the small fish entering the population at this time were 90-day wonders from the Nanaimo River or were the survivors from the mud flat population.

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TABLE 1

LENGTH AND WEIGHT OF CHUM FRY SAMPLED DURING THE DOWNSTREAM RUN IN THE NANAIMO RIVER

WEEK STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
9MAR75	1	60	34	43	38.3	2.0	0.30	0.75	0.46	0.08
16MAR75	2	48	31	43	36.9	3.2	0.25	0.63	0.44	0.09
23MAR75	3	215	31	44	36.8	2.0	0.25	0.68	0.42	0.06
30MAR75	4	213	28	40	35.5	2.1	0.30	0.59	0.41	0.05
6APR75	5	178	32	40	35.8	1.7	0.22	0.56	0.40	0.05
13APR75	6	134	30	40	35.3	1.9	0.30	0.51	0.40	0.04
20APR75	7	100	33	39	36.0	1.2	0.30	0.50	0.40	0.04
27APR75	8	140	32	39	35.5	1.5	0.28	0.55	0.40	0.05
4MAY75	9	120	31	38	35.4	1.4	0.29	0.51	0.39	0.04
11MAY75	10	140	34	38	36.1	1.1	0.30	0.51	0.40	0.04
18MAY75	11	60	31	39	35.5	1.5	0.29	0.56	0.39	0.05
		*****	**	**	****	***	****	****	****	****
TOTALS		1412	28	44	36.0	1.9	0.22	0.75	0.41	0.05

LENGTH AND WEIGHT OF CHINOOK FRY SAMPLED DURING THE DOWNSTREAM RUN IN THE NANAIMO RIVER

WEEK STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
9MAR75	1	0	0	0	0.0	0.0	0.00	0.00	0.00	0.00
16MAR75	2	0	0	0	0.0	0.0	0.00	0.00	0.00	0.00
23MAR75	3	0	0	0	0.0	0.0	0.00	0.00	0.00	0.00
30MAR75	4	1	38	38	0.0	0.0	0.58	0.58	0.00	0.00
6APR75	5	26	35	42	38.8	1.7	0.41	0.69	0.57	0.08
13APR75	6	21	35	42	38.9	1.5	0.41	0.78	0.61	0.08
20APR75	7	2	37	41	39.0	2.0	0.50	0.67	0.58	0.09
27APR75	8	20	36	41	38.7	1.6	0.42	0.74	0.59	0.09
4MAY75	9	20	33	45	36.3	2.7	0.33	1.02	0.52	0.14
11MAY75	10	0	0	0	0.0	0.0	0.00	0.00	0.00	0.00
18MAY75	11	0	0	0	0.0	0.0	0.00	0.00	0.00	0.00
		*****	**	**	****	***	****	****	****	****
TOTALS		90	33	45	38.3	2.2	0.33	1.02	0.57	0.10

TABLE 2

CONDITION FACTOR (K) FOR CHUM
CAPTURED BY DIFFERENT GEAR TYPES

WEEK STARTING	WK #	DOWNSTREAM K	DOWNSTREAM SE	MUDFLATS K	MUDFLATS SE	MS BS K	MS BS SE	50 FM PS K	50 FM PS SE	120 FM PS K	120 FM PS SE
9MAR75	1	0.81	0.22	0.87	0.14						
16MAR75	2	0.87	0.37	0.88	0.20						
23MAR75	3	0.84	0.19	0.86	0.17					1.03	0.07
30MAR75	4	0.93	0.27	0.79	0.21					0.86	0.28
6APR75	5	0.87	0.19	0.92	0.22					0.85	0.15
13APR75	6	0.92	0.22	0.93	0.19					0.85	0.21
20APR75	7	0.87	0.13	0.85	0.29			0.90	0.14	0.86	0.16
27APR75	8	0.91	0.15	0.91	0.22	0.83	0.23	0.87	0.18	0.86	0.24
4MAY75	9	0.88	0.12	0.96	0.33						
11MAY75	10	0.84	0.13	0.91	0.17	0.82	0.20	0.92	0.21	0.81	0.18
18MAY75	11	0.88	0.14	0.84	0.19	0.92	0.23	0.95	0.20	0.93	0.21
25MAY75	12			0.89	0.20	0.90	0.15	0.92	0.19	0.90	0.19
1JUN75	13							1.00	0.19	0.98	0.18
8JUN75	14							0.97	0.20	0.99	0.18
15JUN75	15							0.95	0.14	1.00	0.21
22JUN75	16							0.94	0.19	0.97	0.17
29JUN75	17							0.94	0.27	0.99	0.18
6JUL75	18							0.97	0.18	1.00	0.15

TABLE 3

MEAN RELEASE DATE, MEAN LENGTH, AND MEAN WEIGHT OF MARKED CHUM

TAG COLOR	NUMBER RELEASED	RELEASE DAYS	AV. RELEASE DAY	MEAN LENGTH (MM)	S.E.	MEAN WEIGHT (G)	S.E.
BLUE	3862	70-82	77.7	37.6	2.5	0.44	0.08
ORANGE	9395	83-91	90.0	35.9	2.2	0.41	0.06
GREEN	22032	93-101	100.7	35.9	1.7	0.41	0.05
RED	50034	102-110	107.3	35.5	1.8	0.40	0.04
BL/OR	21702	111-114	114.8	35.9	1.2	0.40	0.04
GR/OR	281360	115-144	128.5	35.7	1.4	0.40	0.05
R-G/OR	303062	111-144	127.5	35.7	1.4	0.40	0.04

TABLE 4

LENGTH AND WEIGHT OF CHUM FRY SAMPLED FROM THE NANAIMO RIVER MUDFLAT

DATE STARTING	RN	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
9MAR75	1	30	32	43	37.3	2.3	0.28	0.74	0.46	0.08
16MAR75	2	39	33	52	40.1	3.4	0.33	1.25	0.58	0.17
23MAR75	3	32	34	50	39.0	3.5	0.30	1.25	0.53	0.19
30MAR75	4	379	32	51	39.6	3.4	0.27	1.35	0.51	0.20
6APR75	5	126	32	57	43.4	6.8	0.35	1.90	0.85	0.47
13APR75	6	185	35	64	47.9	5.1	0.30	2.30	1.06	0.38
20APR75	7	54	33	58	41.8	5.5	0.26	1.28	0.63	0.28
27APR75	8	32	35	48	39.7	2.5	0.33	0.79	0.58	0.12
4MAY75	9	50	32	54	42.5	5.4	0.38	1.60	0.77	0.33
11MAY75	10	69	33	53	41.9	4.1	0.35	1.41	0.69	0.23
18MAY75	11	50	35	61	42.0	5.1	0.32	2.05	0.67	0.34
25MAY75	12	50	33	52	41.7	4.7	0.33	1.16	0.67	0.23
BLUE										
23MAR75	3	1	39	39	39.0	0.0	0.51	0.51	0.51	0.00
30MAR75	4	2	41	45	43.0	2.0	0.62	0.83	0.73	0.10
6APR75	5	1	50	50	50.0	0.0	0.68	0.68	0.68	0.00
13APR75	6	1	47	47	47.0	0.0	1.01	1.01	1.01	0.00
ORANGE										
23MAR75	3	2	34	38	36.5	1.5	0.32	0.47	0.40	0.07
30MAR75	4	1	38	38	38.0	0.0	0.41	0.41	0.41	0.00
6APR75	5	19	37	47	41.8	2.4	0.48	0.88	0.64	0.12
13APR75	6	19	43	52	48.4	2.4	0.79	1.40	1.09	0.16
20APR75	7	1	53	53	53.0	0.0	1.79	1.79	1.79	0.00
GREEN										
6APR75	5	22	34	41	38.7	1.7	0.38	0.68	0.49	0.07
13APR75	6	18	39	47	43.0	2.4	0.48	1.10	0.76	0.15
20APR75	7	4	41	47	45.0	2.4	0.61	1.11	0.88	0.18
27APR75	8	1	45	45	45.0	0.0	0.95	0.95	0.95	0.00
4MAY75	9	4	52	56	53.8	1.5	1.48	1.92	1.64	0.18
RED										
13APR75	6	7	46	43	38.3	2.1	0.40	0.64	0.48	0.08
20APR75	7	10	35	41	38.5	1.6	0.40	0.61	0.51	0.06
27APR75	8	7	37	45	40.9	3.2	0.52	0.99	0.78	0.15
4MAY75	9	6	46	50	48.7	1.6	0.92	1.35	1.17	0.16
RE-OR										
20APR75	7	4	36	38	37.0	0.7	0.39	0.50	0.42	0.05
27APR75	8	1	38	38	38.0	0.0	0.45	0.45	0.45	0.00
4MAY75	9	4	41	48	44.5	2.5	0.62	1.06	0.85	0.16
GR-OR										
27APR75	8	12	34	39	37.5	1.6	0.30	0.51	0.43	0.06
4MAY75	9	22	33	45	40.6	3.7	0.31	0.91	0.65	0.20
11MAY75	10	13	37	47	41.8	2.7	0.50	1.01	0.68	0.15

TABLE 5

LENGTH AND WEIGHT OF CHINOOK FRY SAMPLED FROM THE NANAIMO RIVER MUDFLAT

DATE STARTING	PK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
					UNMARKED						
23MAR75	3	1	38	38	38.0	0.0	0.51	0.51	0.51	0.00	
30MAR75	4	9	38	50	42.8	3.9	0.41	1.30	0.75	0.29	
20APR75	7	20	38	65	42.3	5.6	0.57	3.52	0.90	0.62	
27APR75	8	3	40	44	42.3	1.7	0.64	0.94	0.83	0.13	
11MAY75	10	24	36	66	47.6	6.7	0.56	3.26	1.27	0.61	
25MAY75	12	30	44	55	49.3	2.7	0.89	2.03	1.25	0.25	
1JUN75	13	17	47	70	58.4	6.8	1.10	4.98	2.47	0.96	
					GREEN						
13APR75	6	3	41	42	41.3	0.5	0.69	0.90	0.80	0.09	
27APR75	8	1	48	48	48.0	0.0	1.38	1.38	1.38	0.00	
					RED						
27APR75	8	1	45	45	45.0	0.0	0.99	0.99	0.99	0.00	
4MAY75	9	1	51	51	51.0	0.0	1.47	1.47	1.47	0.00	
					BL-OR						
20APR75	7	1	40	40	40.0	0.0	0.59	0.59	0.59	0.00	
					GR-OR						
11MAY75	10	4	39	51	45.0	5.1	0.62	1.51	1.04	0.38	

TABLE 6

LENGTH AND WEIGHT OF CHUM FRY SAMPLED BY BEACH SEINE IN THE NEARSHORE AREA

AREA 1 JESSE ISLAND

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
11MAY75	10	113	32	84	41.2	8.2		0.28	6.08	0.71	0.74
GR=OR											
11MAY75	10	34	33	56	37.4	3.6		0.29	1.84	0.48	0.25

AREA 2 HAMMOND BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
18MAY75	11	51	41	70	43.5	7.9		0.20	3.85	0.89	0.62
GR=OR											
18MAY75	11	7	36	51	41.7	5.2		0.38	1.24	0.69	0.32

TABLE A (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY BEACH SEINE IN THE NEARSHORE AREA

AREA 4 SNAKE ISLAND

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
18MAY75	11	50	33	57	41.5	5.8	0.32	1.85	0.73	0.35	
GR=OR											
18MAY75	11	4	35	40	36.8	1.9	0.39	0.60	0.46	0.08	

AREA 5 LOCK BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
11MAY75	10	50	34	51	39.1	3.3	0.28	1.18	0.51	0.16	
25MAY75	12	50	37	60	48.2	4.9	0.45	1.87	1.01	0.32	
GR=OR											
11MAY75	10	17	35	41	37.3	2.0	0.31	0.68	0.43	0.10	
25MAY75	12	8	41	50	47.4	2.9	0.69	1.20	0.99	0.15	

TABLE 6 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED BY BEACH SEINE IN THE NEARSHORE AREA

AREA 8 FALSE NARROWS

DATE STARTING	AK #	*	LENGTH (MM) N	MIN.	MAX.	AVER.	S.E.	*	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
UNMARKED													
18MAY75	11	*	50	35	52	39.6	3.9	*	0.28	1.28	0.54	0.21	*
GR-OR													
18MAY75	11	*	8	38	45	40.4	2.7	*	0.37	0.99	0.58	0.21	*

AREA 9 BOAT HARBOR

DATE STARTING	AK #	*	LENGTH (MM) N	MIN.	MAX.	AVER.	S.E.	*	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
UNMARKED													
18MAY75	11	*	50	37	68	50.8	7.9	*	0.47	2.99	1.33	0.61	*
GR-OR													
18MAY75	11	*	1	54	54	54.0	0.0	*	1.46	1.46	1.46	0.00	*

TABLE 6 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY BEACH SEINE IN THE NEARSHORE AREA

AREA 15 PILOT BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
11MAY75	10	50	32	44	37.8	2.0	0.31	0.59	0.43	0.07	
GR=OR											
11MAY75	10	19	35	39	36.9	1.0	0.28	0.53	0.41	0.06	

AREA 16 DUKE POINT

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
11MAY75	10	107	30	47	36.8	2.4	0.21	1.05	0.41	0.12	
25MAY75	12	50	33	42	36.8	2.2	0.29	0.64	0.45	0.08	
GR=OR											
11MAY75	10	18	34	43	36.9	2.0	0.30	0.82	0.41	0.12	
25MAY75	12	4	34	38	36.3	1.8	0.39	0.51	0.44	0.06	

TABLE A (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY BEACH SEINE IN THE NEARSHORE AREA

AREA 17 — MARK BAY

DATE STARTING	PK	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	MIN.	WEIGHT (G) MAX.	AVER.	S.E.
					RED					
MAY75	9	1	48	48	48.0	0.0	1.16	1.16	1.16	0.00
					GR-OR					
4 MAY75	9	21	35	39	36.6	1.3	0.30	0.50	0.40	0.07
11 MAY75	10		45	41	37.1	1.4	0.32	0.60	0.42	0.07

TABLE 6 (CONT)

LENGTH AND WEIGHT OF UNMARKED CHUM FRY FROM ALL AREAS SAMPLED BY BEACH SEINE IN THE NEARSHORE AREA

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
11MAY75	10	320	30	88	38.9	5.6	0.21	6.08	0.53	0.47	
18MAY75	11	201	41	70	45.9	7.8	0.20	3.85	0.87	0.56	
25MAY75	12	100	33	60	42.5	6.8	0.29	1.67	0.73	0.36	

TABLE 7

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 1 JESSE ISLAND

DATE STARTING	AM	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
[illegible]75	11	50	47	79	51.6	9.5	0.49	5.53	1.50	1.00
25[illegible]75	12	50	38	70	51.1	8.5	0.34	3.16	1.33	0.67
[illegible]75	13	50	34	57	48.3	4.7	0.39	1.65	0.97	0.30
[illegible]75	14	50	41	70	53.1	6.5	0.67	3.49	1.48	0.57
[illegible]75	15	50	44	74	56.8	6.1	0.75	3.77	1.80	0.62
[illegible]75	16	50	44	88	63.8	9.6	0.73	7.10	2.41	1.30
[illegible]75	17	50	51	128	68.5	18.2	0.83	22.22	3.60	4.68
BL-OK										
[illegible]75	11	1	61	61	61.0	0.0	2.51	2.51	2.51	0.00
GR-OK										
[illegible]75	11	5	41	54	49.0	5.4	0.70	1.60	1.24	0.40
[illegible]75	13	1	53	53	53.0	0.0	1.40	1.40	1.40	0.00
[illegible]75	15	1	63	63	63.0	0.0	2.58	2.58	2.58	0.00

AREA 2 HAMMOND BAY

DATE STARTING	AM	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
25MAY75	12	50	37	98	48.0	9.1	0.44	8.58	1.13	1.15
1JUN75	13	78	30	75	51.6	7.6	0.61	4.39	1.50	0.71
8JUN75	14	80	39	92	59.4	9.6	0.49	8.71	2.31	1.33
29JUN75	17	2	56	57	56.5	0.5	1.68	1.87	1.77	0.10
GR-OK										
25MAY75	12	1	39	39	39.0	0.0	0.50	0.50	0.50	0.00
1JUN75	13	3	53	68	59.7	6.2	1.60	3.39	2.31	0.77

TABLE 7 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 5 LOCK BAY

DATE STARTING	WK #	*	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	*	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
UNMARKED													
27APR75	8	*	1	41	41	41.0	0.0	*	0.61	0.61	0.61	0.00	*
4MAY75	9	*	104	33	55	40.0	3.1	*	0.26	1.30	0.54	0.15	*
18MAY75	11	*	50	37	77	49.5	9.9	*	0.50	4.60	1.33	0.99	*
25MAY75	12	*	50	42	84	58.2	9.3	*	0.59	5.54	1.98	1.02	*
1JUN75	13	*	50	39	96	58.7	12.4	*	0.47	8.86	2.34	1.81	*
8JUN75	14	*	50	42	93	59.9	10.4	*	0.62	7.46	2.22	1.30	*
15JUN75	15	*	100	44	94	60.0	8.2	*	0.87	6.76	2.15	0.97	*
22JUN75	16	*	100	44	89	65.7	8.5	*	0.69	6.79	2.73	1.16	*
29JUN75	17	*	17	54	94	74.4	10.6	*	1.65	8.90	4.48	1.86	*
6JUL75	18	*	11	53	76	62.7	7.8	*	1.31	4.30	2.44	0.89	*
GR-OR													
18MAY75	11	*	3	41	42	41.3	0.5	*	0.64	0.66	0.65	0.01	*
25MAY75	12	*	2	45	50	47.5	2.5	*	0.86	1.04	0.95	0.09	*
1JUN75	13	*	1	57	57	57.0	0.0	*	1.71	1.71	1.71	0.00	*
8JUN75	14	*	2	58	64	61.0	3.0	*	1.71	2.51	2.11	0.40	*
15JUN75	15	*	1	58	58	58.0	0.0	*	1.90	1.90	1.90	0.00	*
22JUN75	16	*	6	59	76	69.0	6.6	*	2.14	4.65	3.36	0.90	*

AREA 6 DESCANSO BAY

DATE STARTING	WK #	*	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	*	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
UNMARKED													
27APR75	8	*	5	33	38	35.6	1.6	*	0.30	0.45	0.37	0.05	*
11MAY75	10	*	1	38	38	38.0	0.0	*	0.50	0.50	0.50	0.00	*
18MAY75	11	*	50	34	70	48.1	8.2	*	0.41	3.29	1.12	0.63	*
25MAY75	12	*	50	44	84	56.7	10.8	*	0.80	6.38	2.08	1.45	*
1JUN75	13	*	33	44	95	54.7	10.7	*	0.88	8.53	1.85	1.56	*
8JUN75	14	*	16	39	63	47.1	5.7	*	0.49	2.11	1.00	0.39	*
22JUN75	16	*	3	52	53	52.3	0.5	*	1.13	1.32	1.25	0.09	*
29JUN75	17	*	10	50	66	57.0	4.3	*	1.17	2.59	1.74	0.38	*
6JUL75	18	*	6	58	109	70.8	19.7	*	1.44	13.02	4.29	4.20	*
GR-OR													
18MAY75	11	*	3	40	50	44.0	4.3	*	0.54	1.05	0.73	0.23	*
25MAY75	12	*	1	51	51	51.0	0.0	*	1.28	1.28	1.28	0.00	*

TABLE 7 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 7 — HARMAC AREA

DATE STARTING	WK #	#	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	#	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	#
UNMARKED												
25MAY75	12	* 50	37	81	45.6	5.1	*	0.33	1.96	0.85	0.33	*
8JUN75	14	* 50	44	102	56.8	9.3	*	0.66	9.85	1.82	1.39	*
5JUN75	15	* 17	44	74	58.2	8.9	*	0.84	3.89	1.99	0.92	*
22JUN75	16	* 17	46	91	62.2	10.3	*	0.91	7.66	2.46	1.51	*
29JUN75	17	* 9	45	97	77.8	10.7	*	2.59	9.28	4.74	2.17	*
6JUL75	18	* 8	60	110	72.8	14.3	*	2.13	13.60	4.39	3.67	*
GR-OR												
25MAY75	12	* 5	44	54	48.0	4.1	*	0.70	1.60	1.03	0.35	*

AREA 8 — FALSE NARROWS

DATE STARTING	WK #	#	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	#	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	#
UNMARKED												
18MAY75	11	* 100	34	76	54.5	11.0	*	0.32	4.95	1.81	1.04	*
25MAY75	12	* 50	43	104	78.2	8.2	*	2.38	10.51	5.13	1.62	*
1JUN75	13	* 50	43	98	68.9	10.6	*	0.83	10.13	3.71	1.85	*
8JUN75	14	* 50	53	102	72.7	12.1	*	1.46	11.34	4.47	2.51	*
15JUN75	15	* 50	49	107	69.2	15.1	*	1.14	12.72	3.74	2.67	*
22JUN75	16	* 52	45	108	66.9	14.8	*	0.88	13.15	3.53	2.60	*
29JUN75	17	* 50	43	112	73.7	13.2	*	1.58	15.32	4.57	2.86	*
6JUL75	18	* 4	55	75	63.2	6.2	*	1.73	4.26	2.63	0.79	*
GR-OR												
18MAY75	11	* 1	42	42	42.0	0.0	*	0.56	0.56	0.56	0.00	*
1JUN75	13	* 3	59	73	64.3	6.2	*	1.93	4.30	2.87	1.03	*
8JUN75	14	* 1	58	58	58.0	0.0	*	1.90	1.90	1.90	0.00	*

TABLE 7 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 9 — BOAT HARBOR

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
11MAY75	10	50	54	81	67.5	6.5		1.43	5.17	3.06	0.84
18MAY75	11	50	40	82	63.0	7.8		0.78	4.93	2.51	0.92
25MAY75	12	100	66	102	80.4	6.8		2.49	9.78	5.24	1.38
1JUN75	13	50	55	102	77.5	10.9		1.67	11.33	5.07	2.25
8JUN75	14	130	39	75	57.9	6.0		0.47	4.21	1.90	0.59
15JUN75	15	58	42	103	66.1	13.0		0.62	10.76	3.15	2.00
22JUN75	16	22	47	118	69.5	15.6		1.09	16.78	4.01	3.47
29JUN75	17	50	48	124	74.5	15.5		1.14	23.43	5.05	4.00
6JUL75	18	8	58	67	63.0	3.4		1.71	2.63	2.12	0.39
GREEN											
11MAY75	10	2	67	74	70.5	3.5		2.98	4.21	3.59	0.61
RED											
18MAY75	11	1	63	63	63.0	0.0		2.49	2.49	2.49	0.00
1JUN75	13	1	91	91	91.0	0.0		8.62	8.62	8.62	0.00
GR-OR											
1JUN75	13	1	79	79	79.0	0.0		5.04	5.04	5.04	0.00
8JUN75	14	6	51	62	55.0	4.3		1.29	2.14	1.60	0.35

AREA 10 — JACK POINT

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
25MAY75	12	50	39	71	50.8	8.4		0.43	3.32	1.23	0.67
1JUN75	13	50	39	74	51.5	8.4		0.64	4.17	1.50	0.84
8JUN75	14	26	48	75	62.0	7.5		0.97	4.79	2.44	0.89
15JUN75	15	8	58	107	76.5	20.5		1.09	13.52	5.54	4.89
22JUN75	16	9	57	93	64.4	10.6		1.62	7.25	2.66	1.65
29JUN75	17	7	57	100	70.0	13.8		1.88	9.87	3.91	2.61
6JUL75	18	2	93	99	96.0	3.0		8.24	9.04	8.64	0.40
GR-OR											
25MAY75	12	1	40	40	40.0	0.0		0.47	0.47	0.47	0.00
1JUN75	13	1	62	62	62.0	0.0		2.39	2.39	2.39	0.00

TABLE 7 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 11 ASSEMBLY WHARF

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
11MAY75	10	25	34	47	39.7	6.0	0.31	3.10	0.60	0.52
18MAY75	11	50	37	82	46.9	7.6	0.39	4.96	0.99	0.71
25MAY75	12	50	37	50	44.5	3.0	0.46	1.03	0.73	0.15
1JUN75	13	50	40	62	48.9	4.5	0.52	2.50	1.24	0.36
8JUN75	14	50	34	73	50.6	7.2	0.31	3.86	1.28	0.59
15JUN75	15	29	45	62	54.5	4.1	0.81	2.18	1.57	0.33
22JUN75	16	41	49	73	58.5	6.3	0.96	3.47	1.82	0.61
29JUN75	17	5	58	80	67.0	7.3	1.84	4.79	3.01	0.98
GR-OR										
25MAY75	12	2	45	46	45.5	0.5	0.72	0.87	0.79	0.07
1JUN75	13	11	43	54	48.8	3.4	0.79	1.61	1.21	0.25

AREA 13 DEPARTURE BAY (SOUTH)

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
18MAY75	11	50	34	78	46.8	9.1	0.40	4.71	1.09	0.78
25MAY75	12	50	41	70	51.4	7.2	0.61	3.55	1.42	0.70
1JUN75	13	50	42	78	54.8	9.0	0.62	4.63	1.64	0.88
8JUN75	14	50	46	92	66.6	8.8	0.96	5.98	3.22	1.24
15JUN75	15	1	41	41	41.0	0.0	0.58	0.58	0.58	0.00
29JUN75	17	50	51	77	58.3	5.8	1.07	4.22	1.77	0.64
6JUL75	18	1	106	106	106.0	0.0	14.46	14.46	14.46	0.00
BL-OR										
18MAY75	11	1	57	57	57.0	0.0	2.03	2.03	2.03	0.00
GR-OR										
18MAY75	11	3	37	45	41.3	3.3	0.49	0.86	0.72	0.16
25MAY75	12	1	58	58	58.0	0.0	1.96	1.96	1.96	0.00
1JUN75	13	4	47	60	53.3	4.7	1.09	1.95	1.47	0.32
8JUN75	14	1	63	63	63.0	0.0	2.65	2.65	2.65	0.00

TABLE 7 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 15 — PILOT BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
1JUN75	13	50	47	111	67.9	9.4	0.98	15.69	3.62	2.09	
8JUN75	14	50	38	78	55.2	8.4	0.34	4.86	1.77	0.88	
15JUN75	15	35	40	76	51.7	7.8	0.61	4.42	1.36	0.87	
22JUN75	16	50	51	89	75.5	7.4	1.32	7.53	4.39	1.18	
6JUL75	18	15	55	111	68.7	17.7	1.69	13.06	3.79	3.45	
GR-OR											
1JUN75	13	2	63	66	64.5	1.5	2.49	3.35	2.92	0.43	
8JUN75	14	8	51	73	58.4	6.4	1.40	4.21	2.12	0.85	

AREA 17 — MARK BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
27APR75	8	30	36	57	43.6	5.3	0.44	1.66	0.80	0.32	
4MAY75	9	100	38	68	52.0	5.1	0.39	2.68	1.34	0.42	
11MAY75	10	50	37	81	51.7	12.9	0.34	5.02	1.55	1.28	
18MAY75	11	50	36	84	47.6	9.0	0.39	6.38	1.13	0.96	
25MAY75	12	50	40	62	48.2	5.2	0.47	2.01	0.96	0.33	
1JUN75	13	50	42	66	52.9	4.8	0.69	2.73	1.45	0.38	
8JUN75	14	46	52	79	66.7	6.5	1.30	5.28	2.94	0.85	
22JUN75	16	50	47	86	66.0	7.9	0.97	6.47	2.94	1.10	
29JUN75	17	7	53	98	68.4	16.8	1.35	9.56	3.83	2.93	
ORANGE											
11MAY75	10	1	69	69	69.0	0.0	3.47	3.47	3.47	0.00	
GREEN											
27APR75	8	4	43	48	45.8	2.3	0.73	1.00	0.87	0.13	
4MAY75	9	4	53	57	54.5	1.5	1.45	1.85	1.58	0.16	
11MAY75	10	3	64	69	66.0	2.2	2.86	3.60	3.11	0.34	
RED											
27APR75	8	7	39	45	42.3	2.1	0.51	0.90	0.69	0.13	
4MAY75	9	4	48	51	49.0	2.9	0.69	1.30	1.12	0.25	
11MAY75	10	1	53	53	53.0	0.0	1.83	1.83	1.83	0.00	
GR-OR											
27APR75	8	2	37	39	38.0	1.0	0.45	0.49	0.47	0.02	
11MAY75	10	5	36	48	40.6	4.9	0.40	1.07	0.64	0.28	
18MAY75	11	3	40	43	41.7	1.2	0.57	0.80	0.67	0.10	
25MAY75	12	3	46	49	48.0	1.0	0.88	1.20	1.04	0.13	
1JUN75	13	1	51	51	51.0	0.0	1.40	1.40	1.40	0.00	
8JUN75	14	1	68	68	68.0	0.0	2.82	2.82	2.82	0.00	

TABLE 7 (CONT)

LENGTH AND WEIGHT OF UNMARKED CHUM FRY FROM ALL AREAS SAMPLED BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
27APR75	8	36	33	57	42.4	5.6	0.30	1.66	0.73	0.33
4MAY75	9	204	33	68	45.9	7.3	0.26	2.68	0.93	0.51
11MAY75	10	126	34	91	55.5	10.3	0.31	5.17	1.95	1.39
18MAY75	11	450	34	84	51.4	10.4	0.32	6.38	1.48	1.02
25MAY75	12	600	34	106	57.8	15.2	0.33	10.51	2.28	2.01
1JUN75	13	561	34	111	57.6	12.6	0.39	15.69	2.24	1.83
8JUN75	14	648	34	102	59.3	10.3	0.31	11.38	2.25	1.44
15JUN75	15	344	40	107	60.6	11.7	0.58	13.52	2.40	1.78
22JUN75	16	394	44	118	66.1	10.9	0.69	16.78	2.98	1.80
29JUN75	17	257	48	128	68.9	14.9	0.83	23.43	3.73	3.37
6JUL75	18	53	53	111	69.0	16.2	1.31	14.46	3.79	3.39

TABLE A

LENGTH AND WEIGHT OF UNMARKED CHINOOK FRY FROM ALL AREAS SAMPLED BY 50 FATHOM PURSE SEINE IN THE NEARSHORE AREA

DATE STARTING	WK	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
25MAY75	12	1	74	74	74.0	0.0	5.43	5.43	5.43	0.00
1JUN75	13	1	121	121	121.0	0.0	20.97	20.97	20.97	0.00
15JUN75	15	3A	70	175	96.7	19.5	3.67	73.22	12.72	11.26
22JUN75	16	1A	72	106	91.8	9.4	4.07	14.34	9.42	3.00
29JUN75	17	46	69	127	95.4	13.9	3.77	25.47	11.04	4.84
6JUL75	18	33	68	118	98.1	11.0	4.09	21.93	12.62	4.34

TABLE 9

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 1 JESSE ISLAND

DATE STARTING	WK #		LENGTH (MM) N	MIN.	MAX.	AVER.	S.E.		WEIGHT (G) MIN.	MAX.	AVER.	S.E.	
UNMARKED													
6APR75	5	*	13	32	49	43.6	5.8	*	0.33	1.23	0.85	0.34	*
20APR75	7	*	55	36	44	39.4	1.9	*	0.39	0.80	0.53	0.09	*
4MAY75	9	*	1	37	37	37.0	0.0	*	0.31	0.31	0.31	0.00	*
11MAY75	10	*	25	33	40	36.9	1.8	*	0.30	0.61	0.42	0.09	*
18MAY75	11	*	50	30	67	49.4	7.8	*	0.55	3.03	1.30	0.66	*
25MAY75	12	*	50	40	73	50.8	6.6	*	0.53	3.51	1.22	0.62	*
1JUN75	13	*	80	41	75	55.3	6.3	*	0.71	3.94	1.84	0.65	*
8JUN75	14	*	50	51	82	59.3	6.1	*	1.14	5.50	1.99	0.77	*
15JUN75	15	*	50	47	81	60.8	6.3	*	1.32	5.93	2.47	0.82	*
22JUN75	16	*	51	54	130	72.7	14.1	*	1.49	25.33	4.31	3.93	*
29JUN75	17	*	50	55	79	65.9	5.6	*	1.59	4.45	2.81	0.77	*
6JUL75	18	*	23	59	119	78.3	12.9	*	2.29	16.37	5.61	3.10	*
GR-OR													
25MAY75	12	*	1	65	65	65.0	0.0	*	2.61	2.61	2.61	0.00	*
1JUN75	13	*	34	47	62	53.1	4.1	*	1.05	2.40	1.54	0.36	*
15JUN75	15	*	1	63	63	63.0	0.0	*	2.43	2.43	2.43	0.00	*

AREA 2 HAMMOND BAY

DATE STARTING	WK #		LENGTH (MM) N	MIN.	MAX.	AVER.	S.E.		WEIGHT (G) MIN.	MAX.	AVER.	S.E.	
UNMARKED													
20APR75	7	*	65	33	63	41.4	4.2	*	0.31	2.06	0.63	0.26	*
27APR75	8	*	9	35	54	42.3	6.6	*	0.34	1.45	0.71	0.41	*
11MAY75	10	*	50	34	60	37.9	3.9	*	0.28	2.35	0.49	0.30	*
1JUN75	13	*	54	39	68	50.4	6.4	*	0.55	3.21	1.28	0.53	*
8JUN75	14	*	80	52	114	73.8	14.0	*	1.16	18.65	4.67	3.47	*
15JUN75	15	*	100	43	86	56.7	7.1	*	0.78	7.25	1.86	0.92	*
22JUN75	16	*	7	58	76	68.7	5.2	*	2.06	5.11	3.54	0.90	*
29JUN75	17	*	5	57	80	65.0	8.0	*	1.82	5.30	3.07	1.18	*
6JUL75	18	*	15	61	124	84.2	18.8	*	1.98	16.20	6.23	4.37	*
ORANGE													
20APR75	7	*	1	46	46	46.0	0.0	*	0.82	0.82	0.82	0.00	*
GR-OR													
1JUN75	13	*	1	47	47	47.0	0.0	*	0.93	0.93	0.93	0.00	*
8JUN75	14	*	8	60	97	70.6	10.5	*	1.99	9.25	3.76	2.12	*

TABLE 9 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 3 FIVE FINGER ISLANDS

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
6APR75	5	2	34	36	35.0	1.0	0.38	0.47	0.42	0.05
20APR75	7	1	38	38	38.0	0.0	0.41	0.41	0.41	0.00
27APR75	8	1	39	39	39.0	0.0	0.50	0.50	0.50	0.00
11MAY75	10	1	37	37	37.0	0.0	0.46	0.46	0.46	0.00
8JUN75	14	21	57	85	72.1	7.3	2.01	6.66	4.36	1.32
15JUN75	15	50	55	87	65.4	6.8	1.58	6.48	2.89	1.01
22JUN75	16	28	67	94	75.8	6.8	2.90	8.69	4.81	1.43
29JUN75	17	2	67	73	70.0	3.0	3.22	4.18	3.70	0.48
6JUL75	18	20	70	107	89.4	12.8	3.22	12.92	7.76	3.26
GR-OR										
15JUN75	15	1	71	71	71.0	0.0	3.66	3.66	3.66	0.00

AREA 4 SNAKE ISLAND

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
18MAY75	11	7	34	41	37.6	2.4	0.29	0.70	0.47	0.11
8JUN75	14	50	57	107	78.7	12.0	1.56	11.78	4.94	2.39
15JUN75	15	50	58	97	72.8	6.6	1.56	8.92	3.80	1.15
22JUN75	16	12	71	136	113.0	20.0	3.63	27.86	16.41	7.84
29JUN75	17	43	58	135	99.6	14.3	1.88	25.16	10.60	4.28
6JUL75	18	13	65	113	92.8	14.7	2.37	13.55	8.22	3.34
GR-OR										
15JUN75	15	1	78	78	78.0	0.0	4.31	4.31	4.31	0.00

TABLE 9 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 5 LOCK BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
20APR75	7	8	38	45	42.4	2.7	0.44	0.81	0.65	0.15
27APR75	8	76	36	48	39.2	2.2	0.37	0.87	0.51	0.10
4MAY75	9	1	36	36	36.0	0.0	0.40	0.40	0.40	0.00
25MAY75	12	5	57	72	63.8	6.4	1.89	4.15	2.71	1.00
8JUN75	14	50	47	114	67.5	13.2	0.92	11.72	3.35	2.25
15JUN75	15	50	43	77	60.6	5.9	0.67	4.51	1.92	0.69
22JUN75	16	100	53	156	76.0	13.8	1.42	42.48	4.80	4.65
29JUN75	17	33	66	115	83.8	10.7	2.73	15.19	5.94	2.60
6JUL75	18	50	62	111	90.8	10.2	2.11	13.87	7.66	2.44
GR-OR										
8JUN75	14	1	74	74	74.0	0.0	4.11	4.11	4.11	0.00
15JUN75	15	1	66	66	66.0	0.0	2.33	2.33	2.33	0.00
22JUN75	16	1	68	68	68.0	0.0	2.86	2.86	2.86	0.00

AREA 6 DESCANSO BAY

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED										
30MAR75	4	2	42	43	42.5	0.5	0.79	0.79	0.79	0.00
6APR75	5	16	36	47	39.4	2.9	0.31	0.80	0.48	0.14
13APR75	6	81	37	59	41.6	4.3	0.38	1.84	0.64	0.28
27APR75	8	6	37	42	38.5	1.7	0.38	0.58	0.46	0.06
11MAY75	10	65	35	45	37.9	1.6	0.31	0.84	0.43	0.09
18MAY75	11	50	45	78	46.7	8.1	0.41	4.56	1.02	0.69
25MAY75	12	50	43	83	53.8	7.1	0.64	4.88	1.45	0.81
1JUN75	13	50	42	89	52.0	8.1	0.59	7.18	1.35	0.98
8JUN75	14	50	50	95	70.2	10.4	1.19	10.20	3.94	1.99
15JUN75	15	34	47	84	66.1	9.1	1.03	6.95	3.38	1.42
22JUN75	16	13	63	97	78.3	9.3	2.80	10.92	5.68	2.12
6JUL75	18	1	63	63	63.0	0.0	2.85	2.85	2.85	0.00
GREEN										
13APR75	6	3	37	40	38.7	1.2	0.40	0.51	0.46	0.05
GR-OR										
11MAY75	10	4	37	39	37.7	0.9	0.32	0.40	0.37	0.03
18MAY75	11	9	38	46	41.9	2.3	0.43	0.90	0.64	0.14
25MAY75	12	3	59	63	60.7	1.7	1.81	2.19	1.94	0.18
1JUN75	13	1	54	54	54.0	0.0	1.38	1.38	1.38	0.00
15JUN75	15	1	67	67	67.0	0.0	3.27	3.27	3.27	0.00

TABLE 9 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 7 — HARVEST AREA

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
20APR75	7	2	34	38	36.0	2.0	0.30	0.39	0.34	0.04	
27APR75	8	26	35	49	40.6	3.6	0.34	1.07	0.58	0.18	
18MAY75	11	41	39	78	48.4	7.8	0.56	4.71	1.22	0.79	
25MAY75	12	50	48	90	63.4	9.2	1.05	7.62	2.62	1.29	
1JUN75	13	50	43	93	55.9	10.7	0.70	8.11	1.97	1.41	
8JUN75	14	50	46	84	64.0	9.7	0.94	5.90	2.81	1.31	
22JUN75	16	100	42	101	59.7	9.9	0.74	11.62	2.25	1.43	
29JUN75	17	50	54	116	78.4	12.2	1.49	16.22	4.96	2.66	
6JUL75	18	20	77	110	97.9	9.9	4.10	12.81	9.15	2.65	
RED											
27APR75	8	1	44	44	44.0	0.0	0.74	0.74	0.74	0.00	
GR-OR											
18MAY75	11	1	52	52	52.0	0.0	1.45	1.45	1.45	0.00	
25MAY75	12	1	57	57	57.0	0.0	1.49	1.49	1.49	0.00	
1JUN75	13	1	56	56	56.0	0.0	1.75	1.75	1.75	0.00	
8JUN75	14	2	67	69	68.0	1.0	3.28	3.30	3.29	0.01	

AREA 8 — FALSE NARROWS

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
27APR75	8	43	38	65	45.2	6.7	0.50	2.55	0.91	0.51	
1JUN75	13	101	56	95	71.9	7.9	1.58	8.74	3.94	1.36	
8JUN75	14	50	59	105	83.5	10.7	1.97	12.94	6.63	2.57	
15JUN75	15	50	57	114	77.7	11.6	1.87	16.48	5.22	2.76	
22JUN75	16	50	57	127	81.1	13.8	1.56	16.32	5.50	3.22	
29JUN75	17	50	53	134	82.6	17.8	1.47	25.31	6.51	4.95	
6JUL75	18	50	57	115	90.2	14.3	1.85	17.60	8.14	3.64	
GR-OR											
15JUN75	15	1	69	69	69.0	0.0	3.50	3.50	3.50	0.00	

TABLE 9 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 9 BOAT HARBOR

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
27APR75	8	7	33	54	48.3	6.6	0.31	1.51	1.12	0.37	
4MAY75	9	2	39	41	40.0	1.0	0.51	0.68	0.59	0.08	
1JUN75	13	32	54	115	88.4	11.9	1.96	13.24	6.85	2.59	
15JUN75	15	130	60	127	93.0	15.7	2.23	23.48	9.00	4.63	
22JUN75	16	7	54	108	75.9	15.0	1.33	13.19	4.74	3.57	
29JUN75	17	80	66	145	89.4	14.7	2.81	34.71	8.18	5.06	
6JUL75	18	50	71	110	96.4	8.2	3.69	13.33	9.24	2.30	
GR-OR											
15JUN75	15	4	73	119	88.0	15.7	3.68	18.30	7.99	4.87	
29JUN75	17	1	88	88	88.0	0.0	6.29	6.29	6.29	0.00	

AREA 10 JACK POINT

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
UNMARKED											
27APR75	8	80	32	55	39.3	4.2	0.29	1.56	0.55	0.23	
11MAY75	10	1	36	36	36.0	0.0	0.35	0.35	0.35	0.00	
18MAY75	11	4	37	43	39.8	2.2	0.39	0.81	0.55	0.16	
1JUN75	13	50	41	73	58.1	8.7	0.68	3.71	1.93	0.85	
8JUN75	14	12	47	65	56.7	6.3	0.99	2.92	1.90	0.62	
22JUN75	16	19	57	99	73.4	11.2	1.85	8.99	3.90	2.01	
29JUN75	17	12	57	88	67.8	9.2	1.85	8.13	3.79	1.82	
6JUL75	18	18	55	125	73.2	14.5	1.64	17.34	4.41	3.32	
GR-OR											
1JUN75	13	2	48	57	52.5	4.5	1.01	2.03	1.52	0.51	

TABLE 9 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 12 PENCASTLE ISLAND EAST

DATE STARTING	WK #		N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.		WEIGHT (G) MIN.	MAX.	AVER.	S.E.	
UNMARKED													
13APR75	6	*	3	37	39	38.3	0.9	*	0.40	0.50	0.44	0.04	*
27APR75	8	*	2	37	41	39.0	2.0	*	0.40	0.49	0.44	0.05	*
8JUN75	14	*	11	44	70	57.5	8.8	*	0.99	4.35	2.22	1.09	*
15JUN75	15	*	50	59	96	73.0	8.1	*	1.82	9.96	4.43	1.75	*
22JUN75	16	*	47	57	116	71.3	8.4	*	1.83	15.23	3.53	1.88	*
29JUN75	17	*	36	61	108	88.5	11.4	*	1.97	12.18	6.93	2.55	*
6JUL75	18	*	3	63	80	71.0	7.0	*	2.87	4.39	3.60	0.62	*
GR-OH													
15JUN75	15	*	2	70	72	71.0	1.0	*	3.80	3.98	3.89	0.09	*

AREA 13 DEPARTURE BAY (SOUTH)

DATE STARTING	WK #		N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.		WEIGHT (G) MIN.	MAX.	AVER.	S.E.	
UNMARKED													
20APR75	7	*	17	34	51	42.9	3.2	*	0.40	1.25	0.70	0.19	*
18MAY75	11	*	50	37	64	46.2	6.0	*	0.39	2.35	0.95	0.45	*
25MAY75	12	*	50	40	79	49.2	6.1	*	0.56	4.82	1.15	0.61	*
1JUN75	13	*	50	44	115	57.3	10.8	*	0.79	16.21	2.15	2.21	*
8JUN75	14	*	50	39	88	59.2	7.3	*	0.54	6.71	2.08	0.94	*
15JUN75	15	*	30	47	72	62.8	5.9	*	0.87	3.60	2.35	0.69	*
22JUN75	16	*	50	49	88	64.6	8.3	*	1.10	6.68	2.58	1.17	*
29JUN75	17	*	25	51	68	58.8	4.3	*	1.17	3.03	1.92	0.44	*
6JUL75	18	*	5	59	86	67.8	9.8	*	2.19	7.23	3.64	1.88	*
RED													
18MAY75	11	*	1	69	69	69.0	0.0	*	3.15	3.15	3.15	0.00	*
GR-OH													
25MAY75	12	*	4	45	53	49.3	2.9	*	0.89	1.30	1.07	0.17	*
1JUN75	13	*	5	50	65	57.8	5.9	*	1.20	2.83	1.97	0.61	*

TABLE 9 (CONT)

LENGTH AND WEIGHT OF CHUM FRY SAMPLED
BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

AREA 15 PILOT BAY

DATE STARTING	AA	*	#	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	*	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
UNMARKED													
13APR75	4	*	4	35	38	36.4	1.0	*	0.38	0.51	0.42	0.04	*
20APR75	7	*	5	34	38	37.2	1.0	*	0.29	0.45	0.38	0.06	*
4MAY75	9	*	2	36	56	46.0	10.0	*	0.42	1.64	1.03	0.61	*
18MAY75	11	*	7	37	46	40.9	3.1	*	0.33	0.83	0.57	0.16	*
8JUN75	14	*	50	49	89	66.0	10.0	*	1.12	6.94	3.00	1.35	*
15JUN75	15	*	50	53	87	70.6	8.5	*	1.38	6.59	3.39	1.24	*
29JUN75	17	*	7	65	92	77.9	7.8	*	3.27	8.98	5.58	1.73	*
6JUL75	18	*	8	76	86	82.8	4.0	*	4.66	5.95	5.24	0.46	*
GR-OR													
18APR75	11	*	1	42	42	42.0	0.0	*	0.63	0.63	0.63	0.00	*

TABLE 9 (CONT)

LENGTH AND WEIGHT OF UNMARKED CHUM FRY FROM ALL AREAS SAMPLED BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

DATE STARTING	WK #	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	WEIGHT (G) MIN.	MAX.	AVER.	S.E.
30MAR75	4	2	42	43	42.5	0.5	0.79	0.79	0.79	0.00
6APR75	5	31	32	49	40.9	5.0	0.31	1.23	0.63	0.30
13APR75	6	93	35	59	41.0	4.3	0.38	1.84	0.61	0.27
20APR75	7	153	33	63	40.7	3.6	0.29	2.06	0.59	0.21
27APR75	8	250	32	65	40.8	5.1	0.29	2.55	0.62	0.33
4MAY75	9	6	36	56	40.8	7.0	0.31	1.64	0.66	0.45
11MAY75	10	142	33	60	37.7	2.7	0.28	2.35	0.45	0.19
18MAY75	11	209	34	78	46.9	7.7	0.29	4.71	1.07	0.66
25MAY75	12	205	40	90	54.5	9.2	0.53	7.62	1.64	1.07
1JUN75	13	467	39	115	60.8	13.6	0.55	16.21	2.58	2.02
8JUN75	14	524	34	114	69.0	13.2	0.54	18.65	3.72	2.53
15JUN75	15	644	43	127	71.3	16.0	0.67	23.48	4.27	3.52
22JUN75	16	484	42	156	71.9	15.2	0.74	42.48	4.20	3.92
29JUN75	17	393	51	145	81.5	16.9	1.17	34.71	6.17	4.34
6JUL75	18	272	55	125	88.8	14.4	1.64	17.60	7.54	3.39

TABLE 10

LENGTH AND WEIGHT OF UNMARKED CHINOOK FRY FROM ALL AREAS SAMPLED BY 120 FATHOM PURSE SEINE IN THE NEARSHORE AREA

DATE STARTING	WK #	*	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	*	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
27APR75	8	*	2	279	305	292.0	13.0	*	0.00	0.00	0.00	0.00	*
4MAY75	9	*	7	133	330	285.9	63.0	*	28.00	28.00	28.00	0.00	*
11MAY75	10	*	2	141	291	216.0	75.0	*	30.75	30.75	30.75	0.00	*
18MAY75	11	*	1	115	115	115.0	0.0	*	17.19	17.19	17.19	0.00	*
1JUN75	13	*	11	116	150	132.9	9.2	*	17.11	36.96	26.34	5.70	*
8JUN75	14	*	2	127	143	135.0	8.0	*	28.35	35.12	31.73	3.38	*
15JUN75	15	*	5	95	171	133.0	30.0	*	9.80	66.92	33.41	21.50	*
22JUN75	16	*	21	78	184	114.8	31.8	*	4.95	74.07	21.61	20.53	*
29JUN75	17	*	36	74	200	103.5	27.5	*	4.58	102.30	17.34	19.67	*
6JUL75	18	*	31	72	144	91.5	13.1	*	4.61	36.32	10.58	5.60	*

TABLE 11

LENGTH AND WEIGHT OF UNMARKED CHUM FRY FROM ALL AREAS SAMPLED BY TAG BOAT TRAWLS IN THE NEARSHORE AREA

DATE STARTING	WK #	*	N	LENGTH (MM) MIN.	MAX.	AVER.	S.E.	*	N	WEIGHT (G) MIN.	MAX.	AVER.	S.E.	*
6APR75	5	*	7	35	40	37.0	1.9	*	7	0.25	0.41	0.33	0.06	*
4MAY75	9	*	23	33	58	42.2	6.5	*	23	0.26	1.73	0.67	0.38	*
1JUN75	13	*	12	49	89	61.9	10.3	*	12	1.40	7.04	2.61	1.55	*
29JUN75	17	*	9	80	107	92.6	12.9	*	9	7.25	13.16	8.24	3.22	*

TABLE 12

MEAN LENGTH AND WEIGHT OF GREEN-ORANGE MARKED FRY CAPTURED IN THE NEARSHORE BY DIFFERENT GEAR TYPES

DATE	WEEK	BEACH SEINES N	BEACH SEINES MEAN LENGTH	BEACH SEINES S.E.	50 FM P.S. N	50 FM P.S. MEAN LENGTH	50 FM P.S. S.E.	120 FM P.S. N	120 FM P.S. MEAN LENGTH	120 FM P.S. S.E.
27APR75	8				2	38.0	1.0			
4MAY75	9	8	36.6	1.3						
11MAY75	10	109	37.3	2.5	5	40.6	4.9	3	37.7	0.9
18MAY75	11	20	40.8	5.0	18	44.0	4.9	11	42.8	3.6
25MAY75	12	12	43.7	5.8	16	47.4	4.8	9	55.7	6.4
1JUN75	13				28	55.5	8.5	44	53.5	4.6
8JUN75	14				19	58.3	5.9	13	69.5	8.6
15JUN75	15				2	60.5	2.5	16	78.8	14.8
22JUN75	16				6	69.0	6.6	1	68.0	0.0
29JUN75	17							1	88.0	0.0

DATE	WEEK	BEACH SEINES N	BEACH SEINES MEAN WEIGHT	BEACH SEINES S.E.	50 FM P.S. N	50 FM P.S. MEAN WEIGHT	50 FM P.S. S.E.	120 FM P.S. N	120 FM P.S. MEAN WEIGHT	120 FM P.S. S.E.
27APR75	8				2	0.47	0.02			
4MAY75	9	8	0.40	0.07						
11MAY75	10	109	0.44	0.16	5	0.64	0.28	3	0.37	0.03
18MAY75	11	20	0.64	0.31	18	0.82	0.35	11	0.71	0.27
25MAY75	12	12	0.81	0.29	16	1.00	0.38	9	1.58	0.55
1JUN75	13				28	1.88	1.01	44	1.57	0.43
8JUN75	14				19	2.01	0.69	13	3.55	1.72
15JUN75	15				2	2.24	0.34	16	5.70	4.16
22JUN75	16				6	3.36	0.90	1	2.86	0.00
29JUN75	17							1	6.29	0.00

TABLE 13

SIZE OF MARKED CHUM FRY ON THE MUDFLAT

DATE	DAY	MEAN DAYS AT LARGE	N	LENGTH MIN	LENGTH MAX	LENGTH MEAN	LENGTH S.E.	WEIGHT MIN	WEIGHT MAX	WEIGHT MEAN	WEIGHT S.E.
BLUE											
26MAR75	85	7.32	1	39	39	39.0	0.0	0.51	0.51	0.51	0.00
2APR75	92	14.32	2	41	45	43.0	2.0	0.62	0.83	0.73	0.10
11APR75	101	23.32	1	50	50	50.0	0.0	0.68	0.68	0.68	0.00
17APR75	107	29.32	1	47	47	47.0	0.0	1.01	1.01	1.01	0.00
ORANGE											
26MAR75	85	1.00	2	35	38	36.5	1.5	0.32	0.47	0.40	0.07
2APR75	92	2.04	1	38	38	38.0	0.0	0.41	0.41	0.41	0.00
9APR75	99	9.04	1	38	38	38.0	0.0	0.49	0.49	0.49	0.00
10APR75	100	10.04	6	39	44	42.2	1.8	0.49	0.83	0.64	0.11
11APR75	101	11.04	12	37	47	41.9	2.5	0.48	0.88	0.64	0.12
17APR75	107	17.04	19	43	52	48.4	2.4	0.79	1.40	1.09	0.16
24APR75	114	24.04	1	53	53	53.0	0.0	1.79	1.79	1.79	0.00
GREEN											
10APR75	100	2.95	9	34	40	37.8	2.0	0.40	0.68	0.49	0.09
11APR75	101	0.28	13	37	41	39.4	0.9	0.38	0.55	0.48	0.04
17APR75	107	6.28	21	39	47	42.8	2.3	0.48	1.10	0.76	0.14
24APR75	114	13.28	4	41	47	45.0	2.4	0.61	1.11	0.88	0.18
1MAY75	121	20.28	2	45	48	46.5	1.5	0.95	1.38	1.17	0.21
8MAY75	128	27.28	4	52	56	53.8	1.5	1.48	1.92	1.64	0.18
RED											
17APR75	107	2.83	7	36	43	38.3	2.1	0.40	0.64	0.48	0.08
24APR75	114	6.71	10	35	41	38.5	1.6	0.40	0.61	0.51	0.06
1MAY75	121	13.71	8	37	45	41.4	3.3	0.52	0.99	0.77	0.16
8MAY75	128	20.71	7	46	51	49.0	1.7	0.92	1.47	1.21	0.18
RL-OR											
24APR75	114	1.59	5	36	40	37.6	1.4	0.39	0.59	0.46	0.03
1MAY75	121	6.19	1	38	38	38.0	0.0	0.45	0.45	0.45	0.00
8MAY75	128	13.19	4	41	48	44.5	2.5	0.62	1.06	0.85	0.16
GR/OR											
1MAY75	121	3.15	12	34	39	37.5	1.6	0.30	0.51	0.43	0.06
8MAY75	128	6.73	22	33	45	40.6	3.7	0.31	0.91	0.65	0.20
14MAY75	134	5.51	12	37	51	42.7	3.8	0.50	1.51	0.76	0.30
16MAY75	136	7.51	5	39	47	42.2	3.2	0.55	1.01	0.77	0.17

TABLE 14

SIZE OF CHUM FRY IN THE NEARSHORE AREA

DATE	DAY	MEAN DAYS AT LARGE	N	LENGTH MIN	LENGTH MAX	LENGTH MEAN	LENGTH S.E.	WEIGHT MIN	WEIGHT MAX	WEIGHT MEAN	WEIGHT S.E.
				ORANGE							
21APR75	111	21.04	1	46	46	46.0	0.0	0.82	0.82	0.82	0.00
13MAY75	133	43.04	1	69	69	69.0	0.0	3.47	3.47	3.47	0.00
				GREEN							
15APR75	105	4.28	3	37	40	38.7	1.2	0.40	0.51	0.46	0.05
30APR75	120	19.28	4	43	48	45.8	2.3	0.73	1.00	0.87	0.13
7MAY75	127	26.28	4	53	57	54.5	1.5	1.45	1.85	1.58	0.16
13MAY75	133	32.28	3	64	69	66.0	2.2	2.86	3.60	3.11	0.34
16MAY75	136	35.28	2	67	74	70.5	3.5	2.98	4.21	3.59	0.61
				RED							
29APR75	119	11.71	1	44	44	44.0	0.0	0.74	0.74	0.74	0.00
30APR75	120	12.71	7	39	45	42.3	2.1	0.51	0.90	0.69	0.13
7MAY75	127	19.71	4	44	51	49.0	2.9	0.69	1.30	1.12	0.25
8MAY75	128	20.71	1	48	48	48.0	0.0	1.16	1.16	1.16	0.00
13MAY75	133	25.71	1	53	53	53.0	0.0	1.83	1.83	1.83	0.00
22MAY75	142	34.71	2	63	69	66.0	3.0	2.49	3.15	2.82	0.33
5JUN75	156	48.71	1	91	91	91.0	0.0	8.62	8.62	8.62	0.00
				BL-OR							
21MAY75	141	26.19	2	57	61	59.0	2.0	2.03	2.51	2.27	0.24
				GR/OR							
30APR75	120	2.47	2	37	39	38.0	1.0	0.45	0.49	0.47	0.02
8MAY75	128	6.73	8	35	39	36.6	1.3	0.30	0.50	0.40	0.07
12MAY75	132	3.51	3	37	39	37.7	0.9	0.32	0.40	0.37	0.03
13MAY75	133	4.51	35	33	48	37.7	2.8	0.29	1.07	0.46	0.15
15MAY75	135	6.51	43	34	56	37.6	3.3	0.30	1.84	0.46	0.23
16MAY75	136	7.51	36	35	41	37.1	1.6	0.28	0.68	0.42	0.08
21MAY75	141	12.51	32	35	54	42.3	5.0	0.38	1.60	0.73	0.33
22MAY75	142	13.51	17	38	54	42.8	4.8	0.37	1.46	0.72	0.32
27MAY75	147	18.51	16	39	63	50.3	6.5	0.50	2.19	1.21	0.46
28MAY75	148	19.51	14	40	65	49.3	6.3	0.47	2.61	1.12	0.52
29MAY75	149	20.51	7	34	49	41.3	6.0	0.39	1.20	0.70	0.31
3JUN75	154	25.51	35	46	69	53.7	5.5	0.91	3.45	1.59	0.55
4JUN75	155	26.51	18	43	62	50.9	4.8	0.79	2.39	1.36	0.37
5JUN75	156	27.51	7	57	79	68.7	8.8	1.71	5.04	3.49	1.33
6JUN75	157	28.51	39	47	68	54.2	5.2	1.05	3.39	1.67	0.54
9JUN75	160	31.51	9	51	69	58.2	6.4	1.29	3.30	2.01	0.75
10JUN75	161	32.51	17	51	97	64.7	10.3	1.40	9.25	2.93	1.76
12JUN75	163	34.51	3	58	74	65.3	6.6	1.71	4.11	2.78	1.00
13JUN75	164	35.51	3	63	66	64.0	1.4	2.44	2.89	2.66	0.18
16JUN75	167	38.51	12	67	119	81.8	15.6	3.27	18.30	6.54	4.48
18JUN75	169	40.51	6	58	78	66.5	6.4	1.90	4.31	2.87	0.84
23JUN75	174	45.51	7	59	76	68.9	6.1	2.14	4.65	3.29	0.85
30JUN75	181	52.51	4	79	102	87.8	8.8	4.96	12.40	7.24	3.02

TABLE 15

REGRESSIONS OF LOG WEIGHT ON DAYS AT LARGE FOR EACH MARK SERIES

MARK COLOR	MARK SERIES	N	SLOPE	S.E.	INTERCEPT	S.E.	% DAILY INCREASE
BLUE	MUDFLAT	5	0.0269	0.0056	-0.847	0.1024	2.727
ORANGE	MUDFLAT	8	0.0624	0.0063	-1.031	0.0762	6.439
	NEARSHORE	3	0.0492	0.0097	-0.991	0.2695	5.043
	COMBINED	10	0.0525	0.0048	-0.983	0.0888	5.390
GREEN	MUDFLAT	7	0.0438	0.0055	-0.763	0.0765	4.477
	50 FM P.S.	5	0.0620	0.0088	-1.029	0.2275	6.396
	NEARSHORE	6	0.0621	0.0065	-1.035	0.1551	6.407
	COMBINED	12	0.0549	0.0048	-0.884	0.0961	5.643
RED	MUDFLAT	5	0.0483	0.0045	-0.906	0.0523	4.949
	50 FM P.S.	6	0.0619	0.0046	-1.037	0.1301	6.386
	120 FM P.S.	3	0.0587	0.0036	-0.916	0.0770	6.046
	NEARSHORE	7	0.0628	0.0033	-1.038	0.0872	6.481
	COMBINED	11	0.0622	0.0026	-1.040	0.0597	6.418
BL-OR	MUDFLAT	4	0.0536	0.0147	-0.954	0.1076	5.506
	NEARSHORE	2	0.0644	-	-0.868	-	6.652
	COMBINED	5	0.0672	0.0072	-1.009	0.0963	6.951
GR-OR	MUDFLAT	5	0.0885	0.0218	-0.964	0.1160	9.253
	NEARSHORE B.S.	9	0.0284	0.0135	-0.950	0.1606	2.881
	50 FM P.S.	17	0.0462	0.0046	-0.781	0.1220	4.728
	120 FM P.S.	16	0.0531	0.0065	-0.759	0.1989	5.454
	TWO BOAT TRAILS	3	0.0550	0.0007	-0.857	0.0234	5.654
	NEARSHORE	21	0.0537	0.0040	-0.879	0.1148	5.517
	COMBINED	26	0.0575	0.0037	-1.016	0.0889	5.919

TABLE 16

REGRESSIONS OF LENGTH ON DAYS AT LARGE FOR EACH MARK SERIES

MARK COLOR	MARK SERIES	N	SLOPE	S.E.	INTERCEPT	S.E.
BLUE	MUDFLAT	5	0.4394	0.100	36.6	1.83
ORANGE	MUDFLAT	8	0.6948	0.082	35.4	0.99
	NEARSHORE	3	0.7599	0.170	34.2	4.70
	COMBINED	10	0.7465	0.060	34.6	1.12
GREEN	MUDFLAT	7	0.5215	0.085	37.7	1.20
	NEARSHORE	6	0.9306	0.134	33.8	3.17
	COMBINED	12	0.8060	0.099	35.4	1.97
[illegible]	MUDFLAT	5	0.5384	0.111	35.8	1.28
	NEARSHORE	7	1.1133	0.133	30.2	3.52
	COMBINED	11	1.0749	0.104	30.5	2.35
[illegible]OR	MUDFLAT	4	0.6078	0.126	35.8	0.92
	NEARSHORE		-	-	-	-
	COMBINED	5	0.8760	0.098	34.7	1.31
[illegible]OR	MUDFLAT	5	0.8961	0.204	35.8	1.09
	NEARSHORE	21	0.9070	0.077	33.7	2.17
	COMBINED	26	0.9244	0.065	32.6	1.67

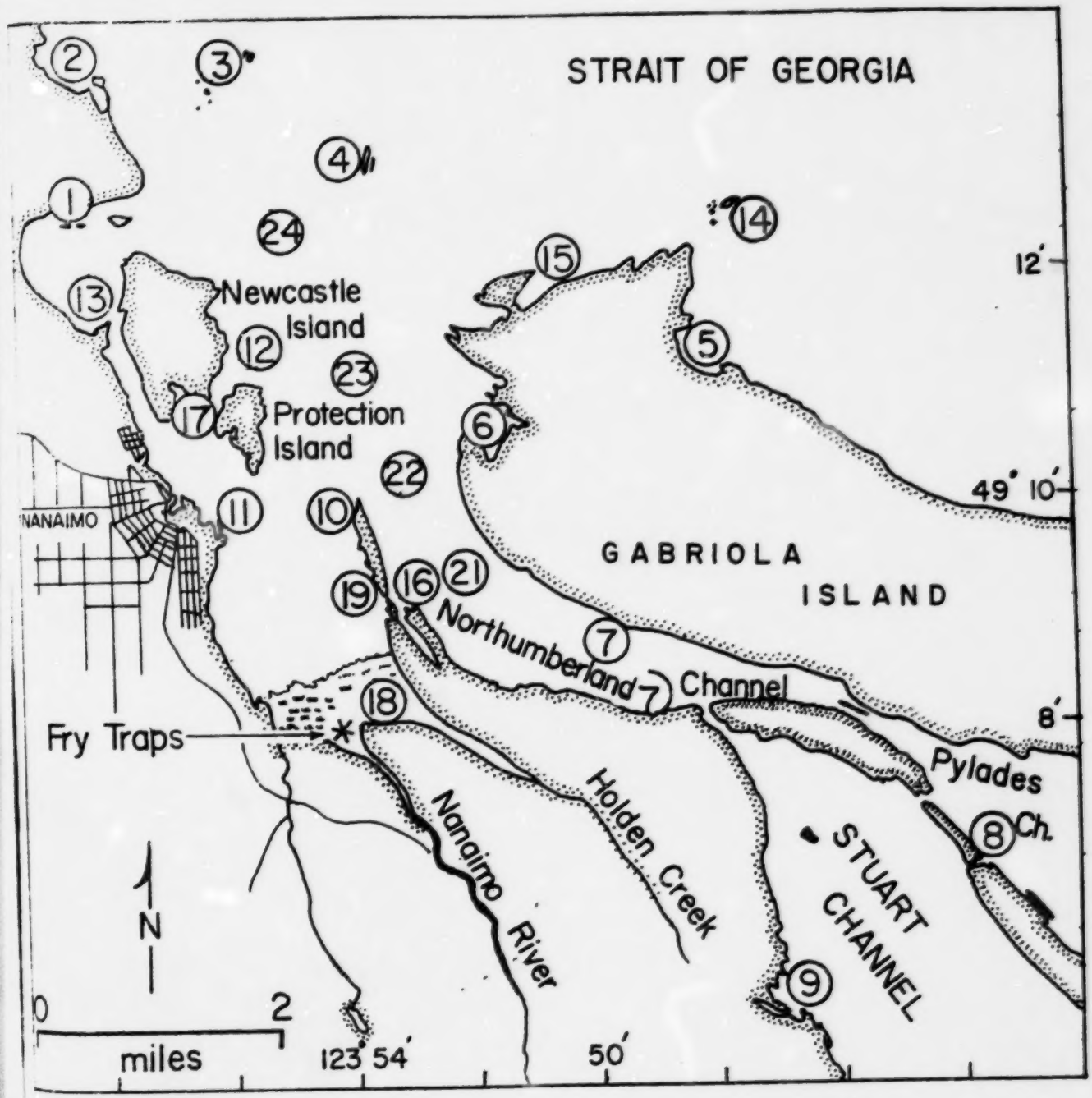


Fig. 1. Map of the study area showing sampling locations.

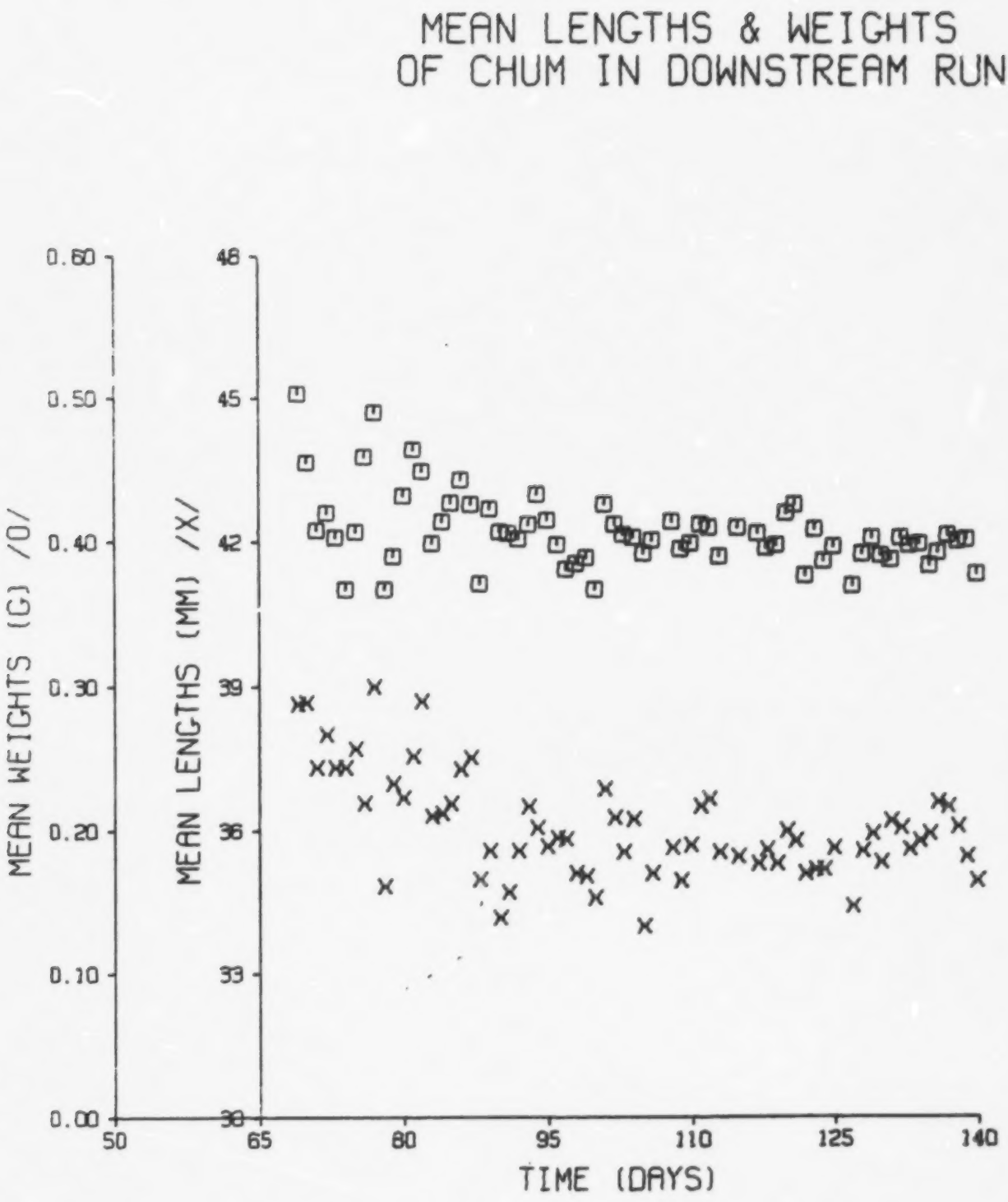
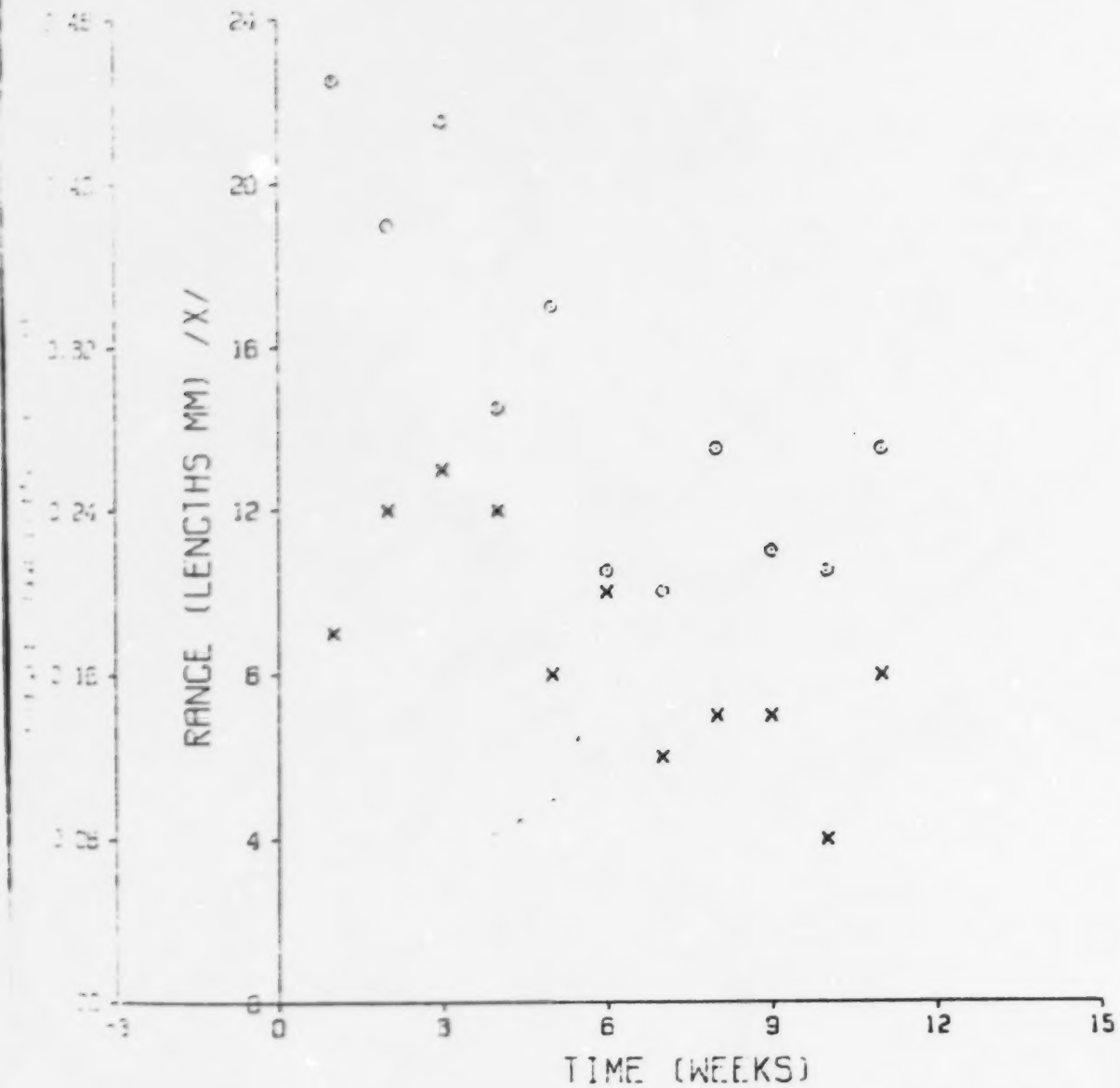


Fig. 2. Mean length and mean weight of daily samples of fry from the Nanaimo River between 9 March (day 68) and 20 May (day 140).



3. Changes in the range in length and weight of fry captured each week in the [illegible] River.

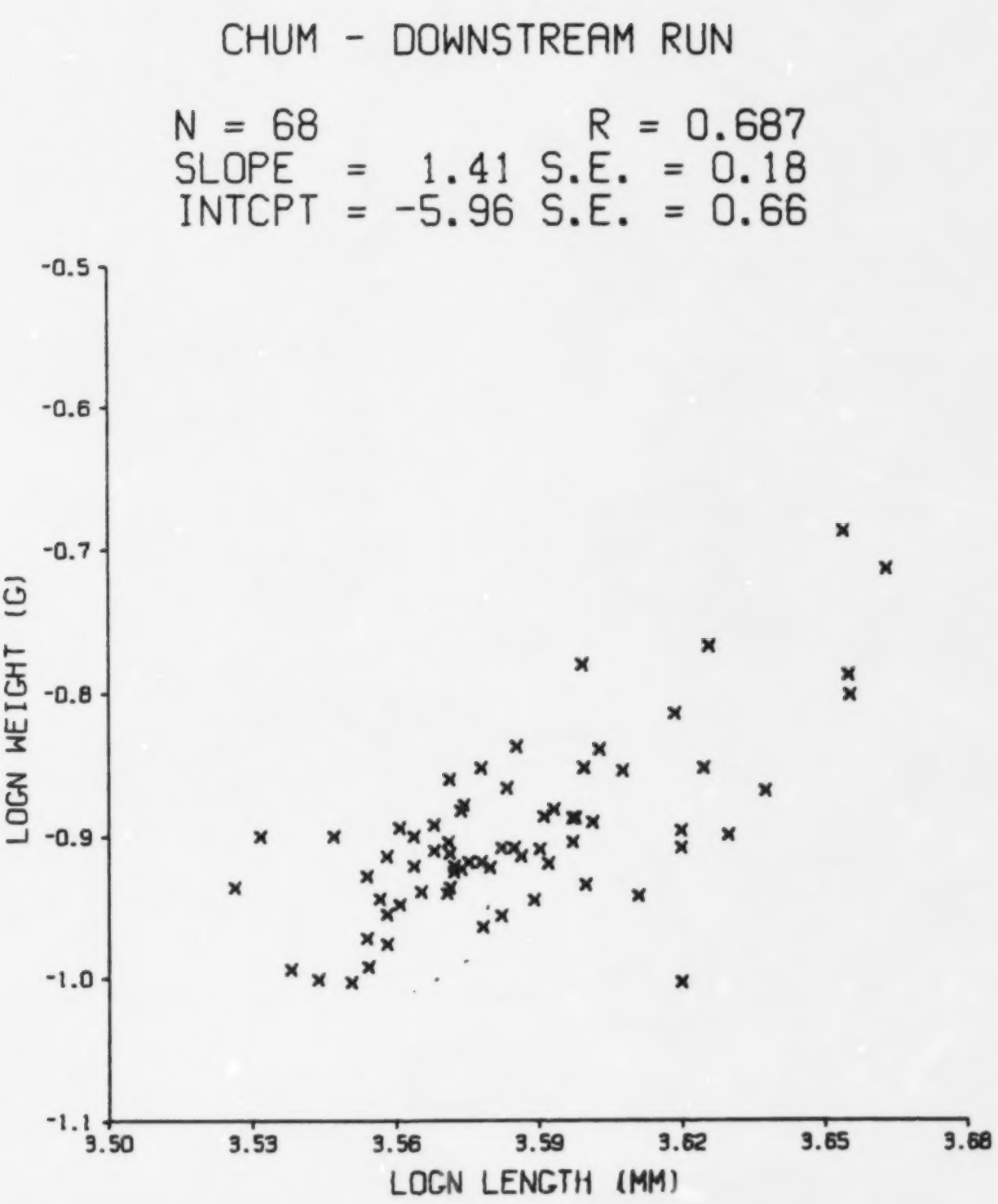


Fig. 4. Relationship between length and weight of downstream migrating chum fry in the Nanaimo River.

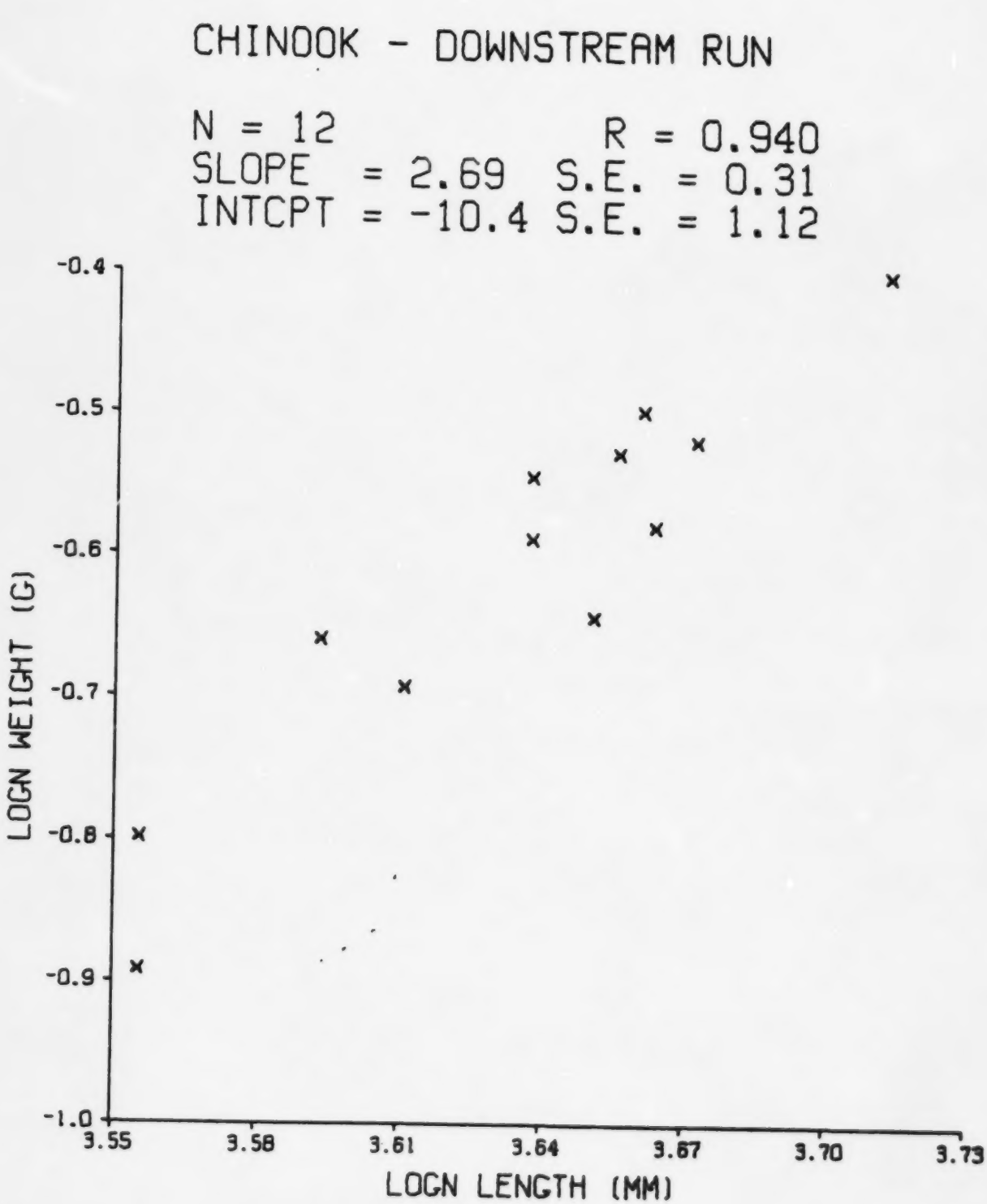


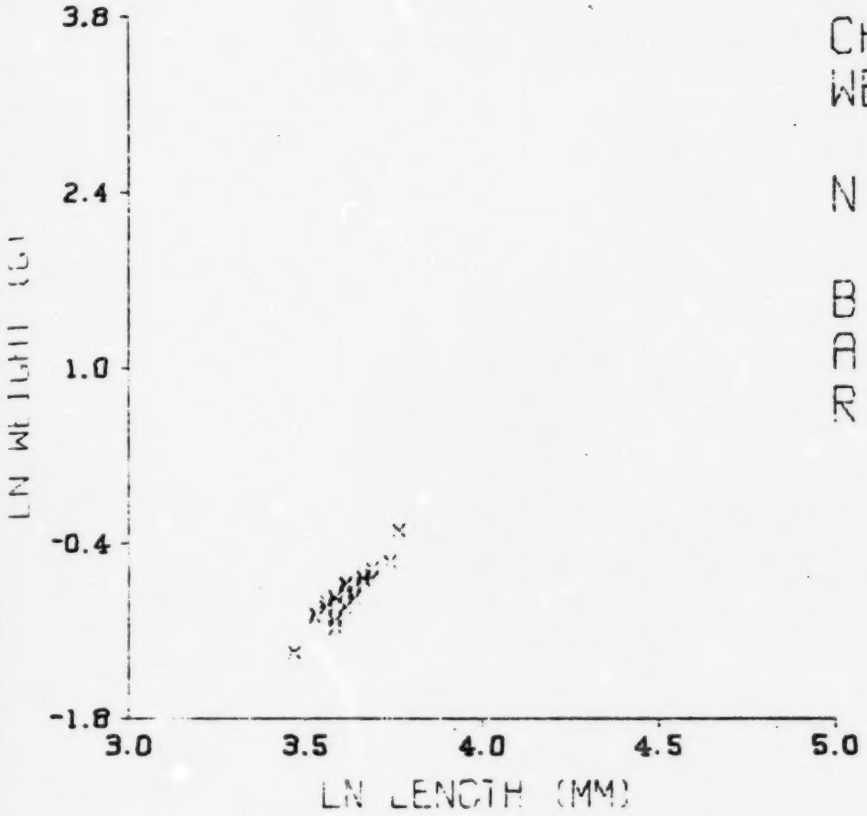
Fig. 5. Relationship between length and weight of downstream migrating chinook fry in the Nanaimo River.

Fig. 6-16. Length frequency, and length-weight relationship for chum captured on the Nanaimo River mud flat from sample Week 1 (Fig. 6) to Week 12 (Fig. 16).

Week 1 = 9-15 March
Week 2 = 16-22 March
Week 3 = 23-29 March
Week 4 = 30 March - 5 April
Week 5 = 6-12 April
Week 6 = 13-19 April
Week 8 = 27 April - 3 May
Week 9 = 4-10 May
Week 10 = 11-17 May
Week 11 = 18-24 May
Week 12 = 25-31 May

Figure Symbols

N = sample size
B = regression slope
A = regression intercept
R = correlation coefficient


CHUM MF BS
WEEK 1
N = 30
B = 2.65
A = -10.39
R = 0.9010
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

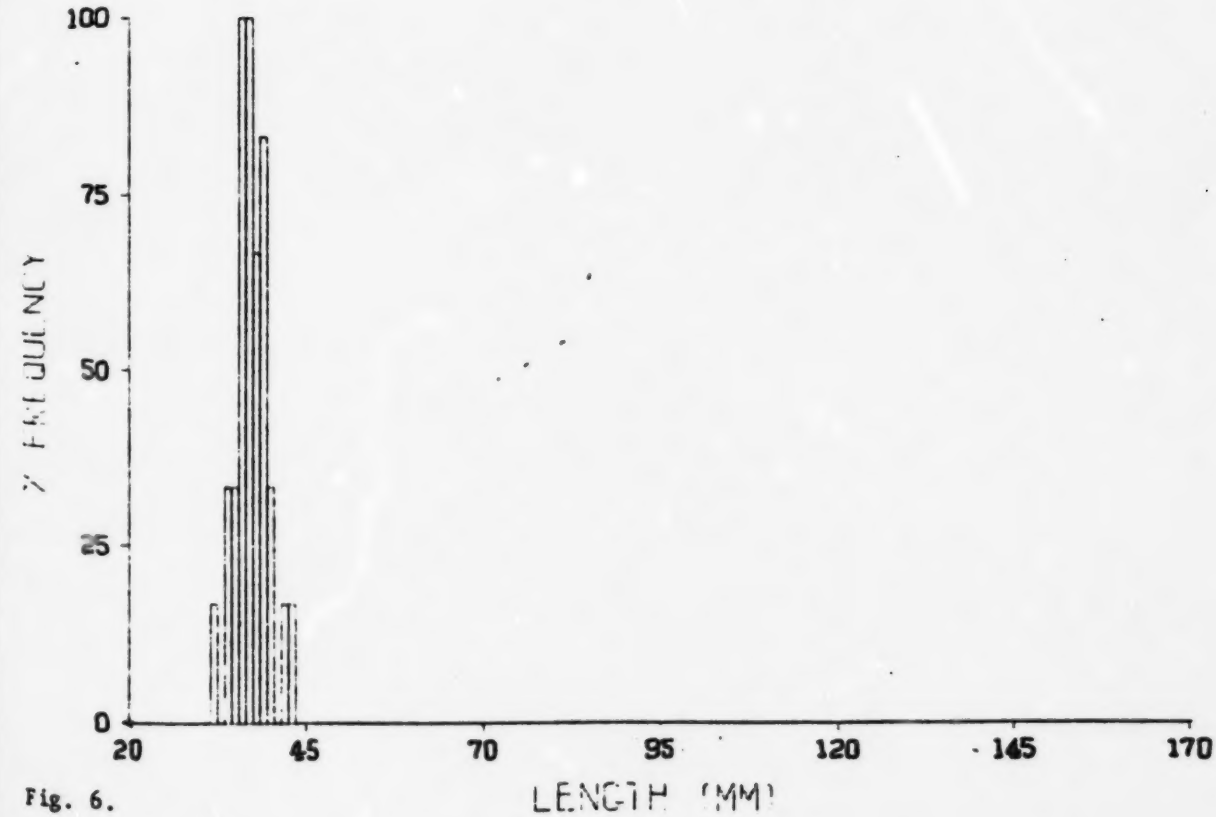
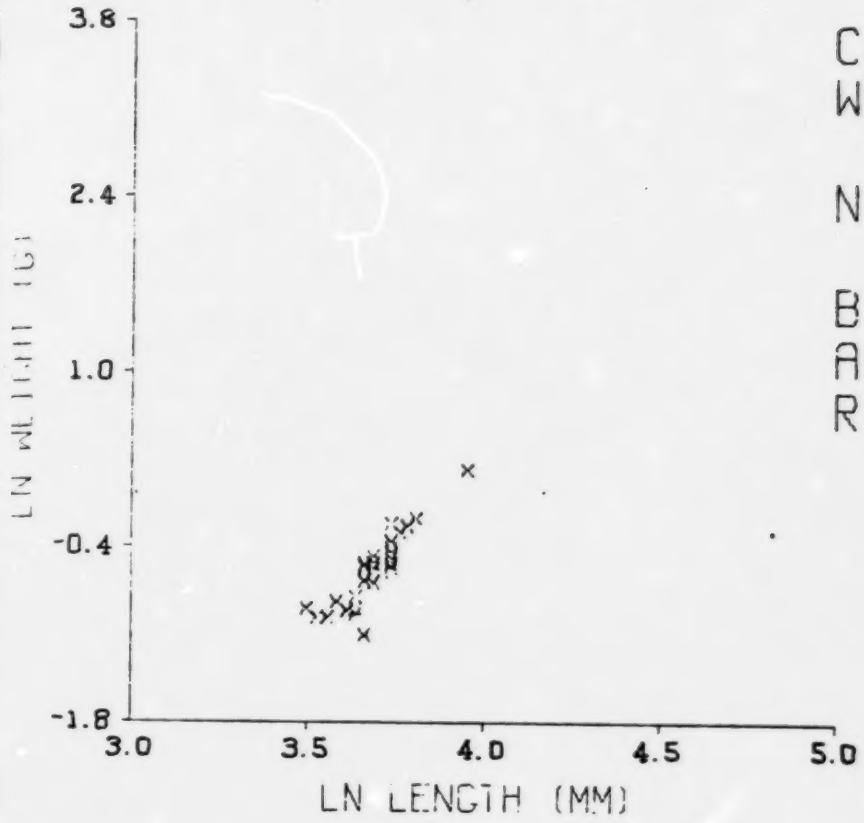

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 6.


CHUM MF BS
WEEK 2
N = 39
B = 3.02
A =-11.71
R =0.9005
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

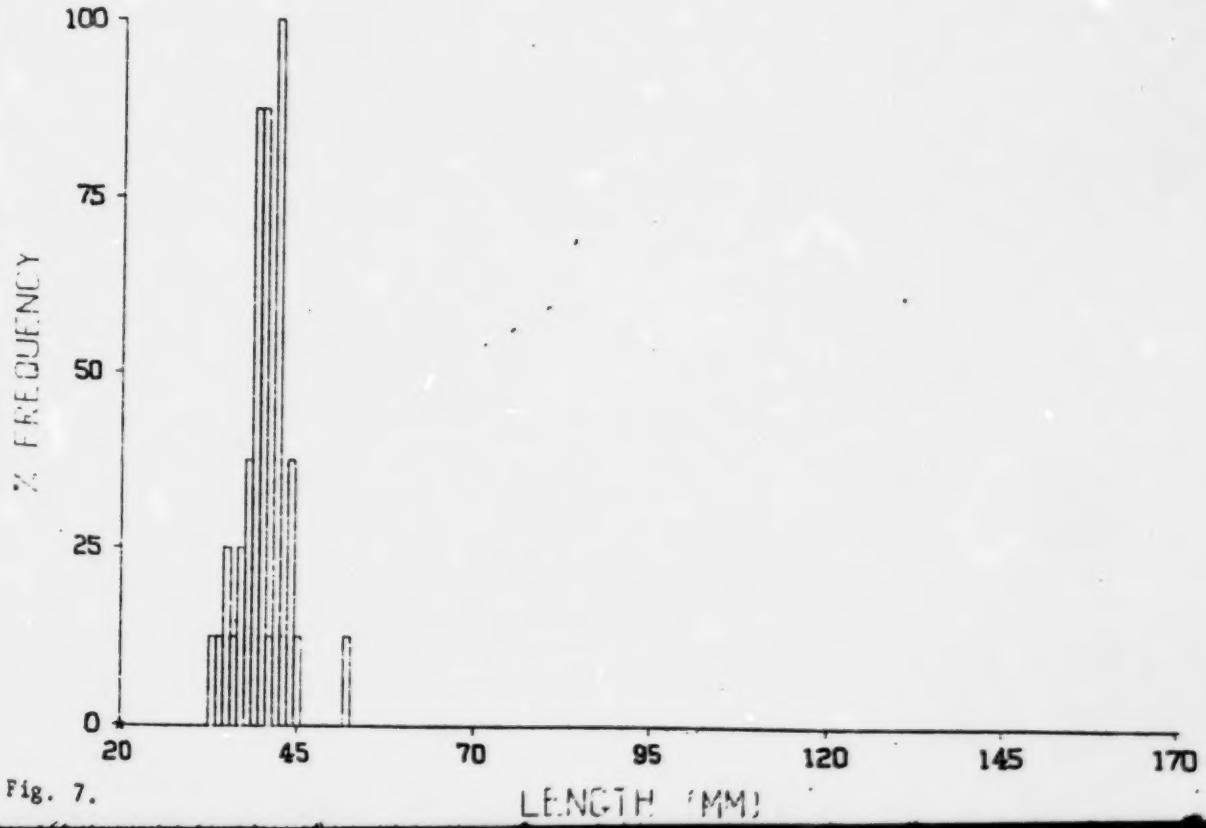
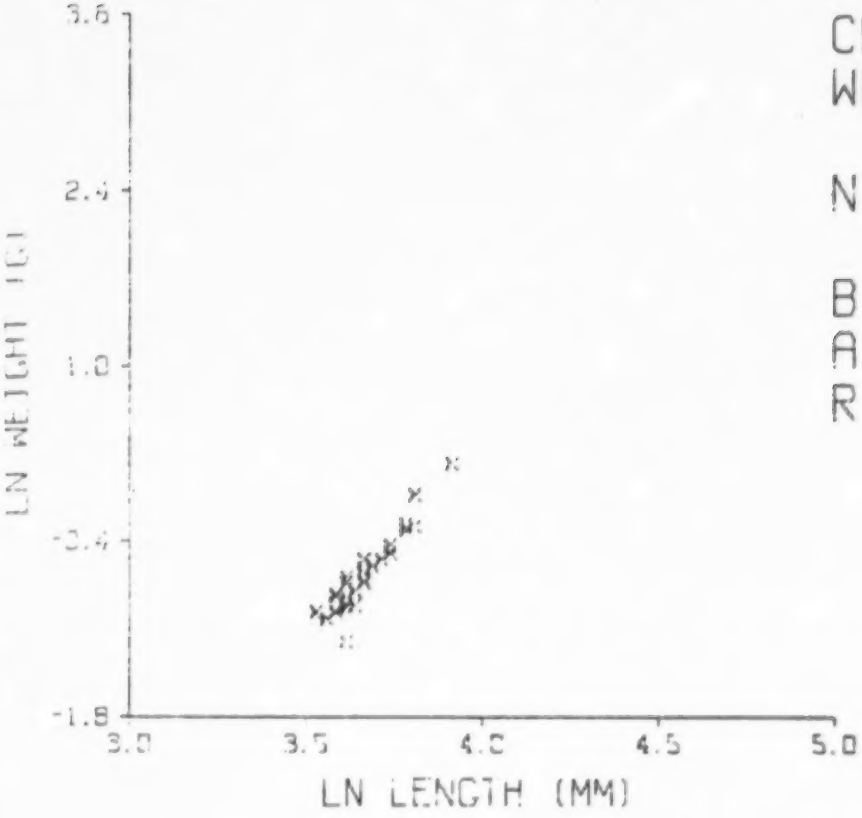

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 7.


CHUM MF BS
WEEK 3
N = 32
B = 3.30
A =-12.77
R =0.9369
LN WEIGHT (G)
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

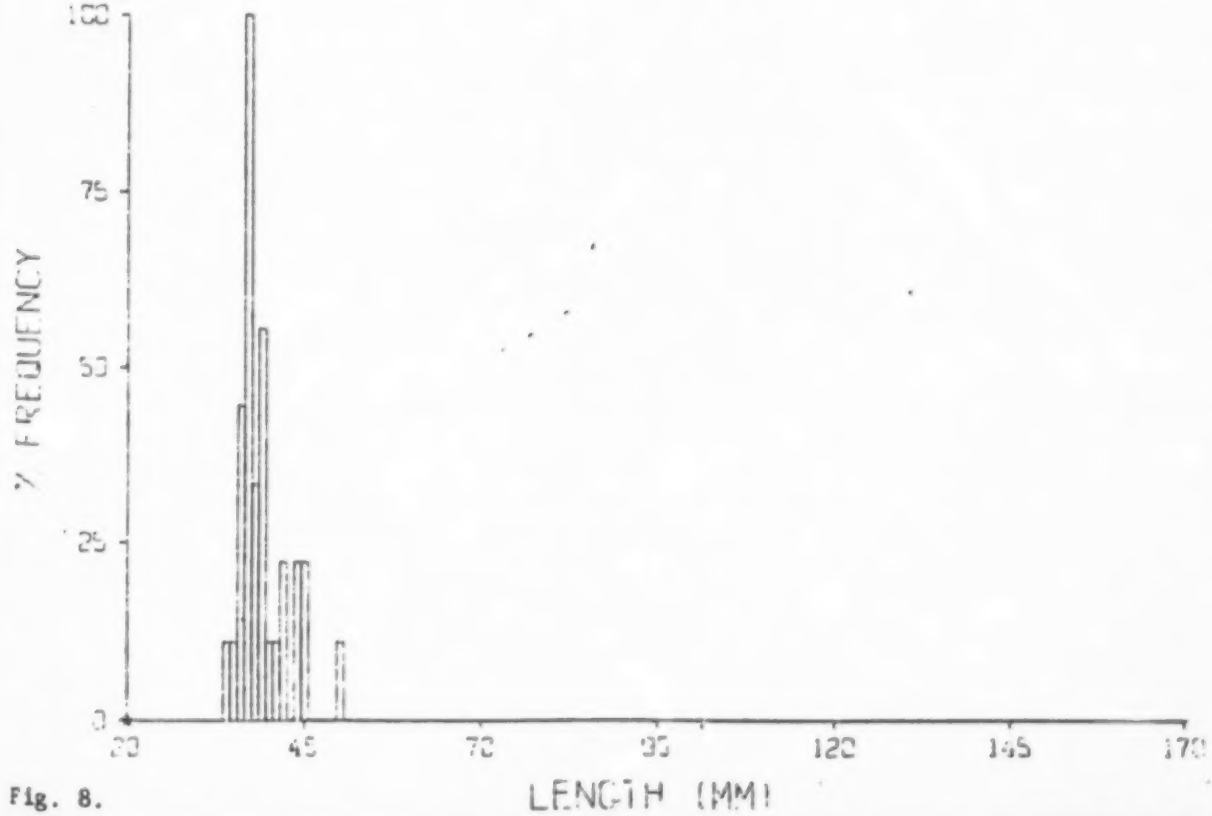
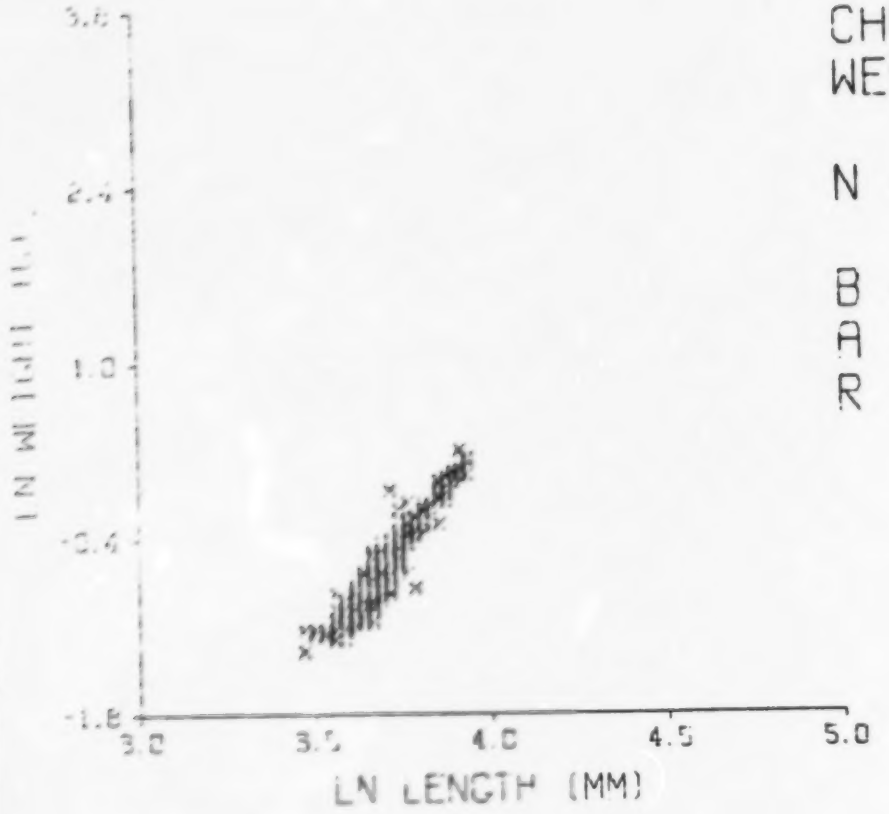

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 8.


CHUM MF BS
WEEK 4
N = 379
B = 3.58
A =-13.89
R =0.9321
LN LENGTH (MM)

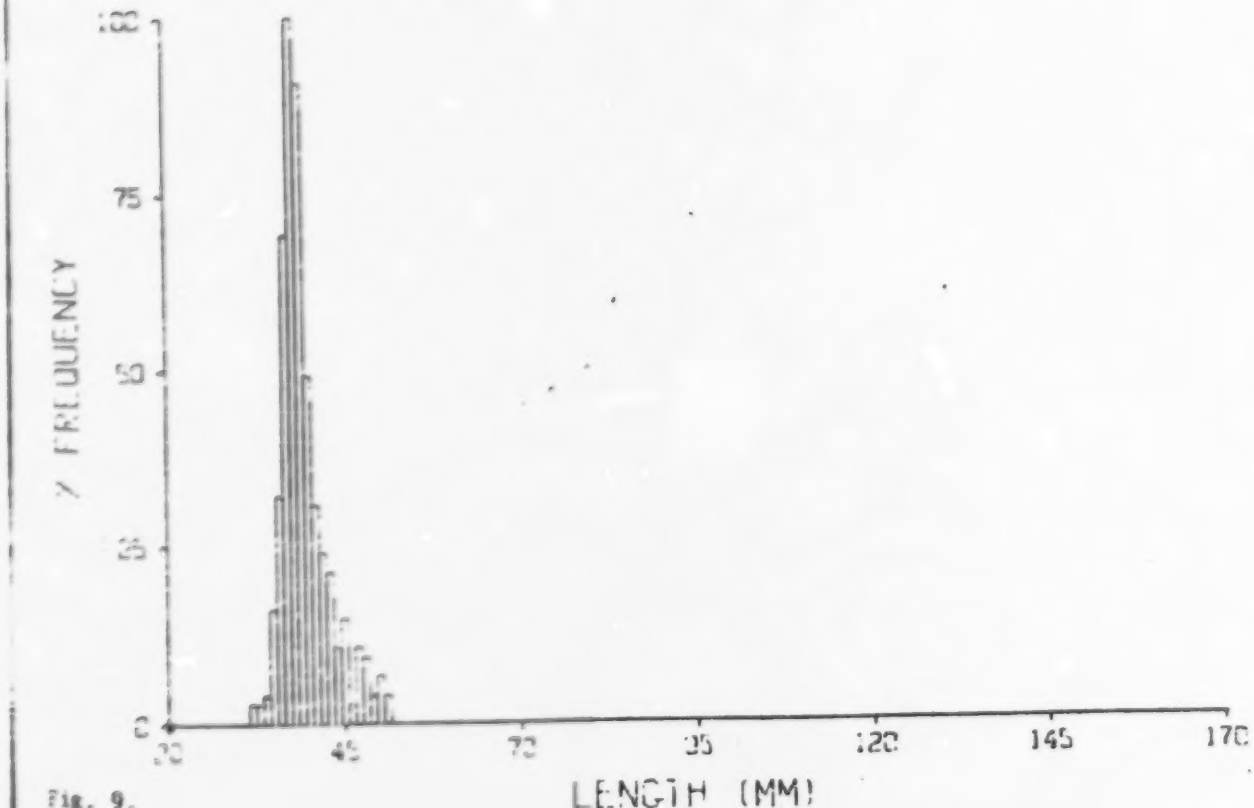
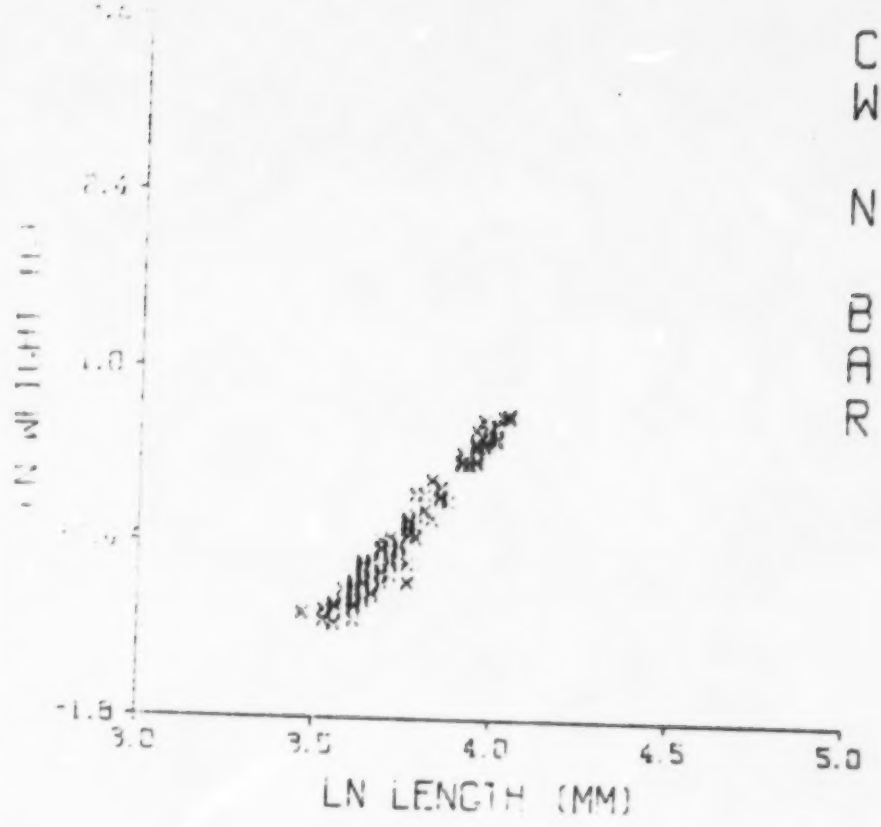

% FREQUENCY
LENGTH (MM)

Fig. 9.


CHUM MF BS
WEEK 5
N = 126
B = 3.32
A =-12.79
R =0.9806
-1.5
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

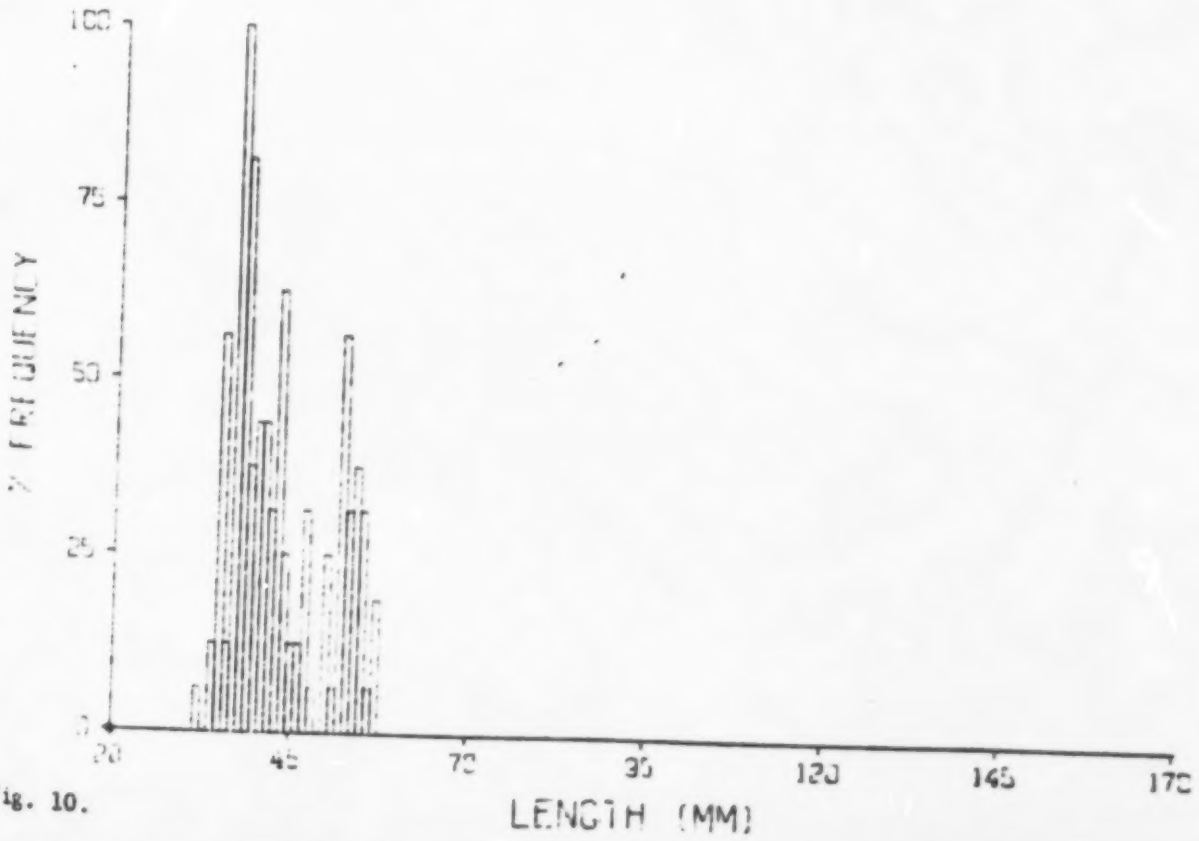
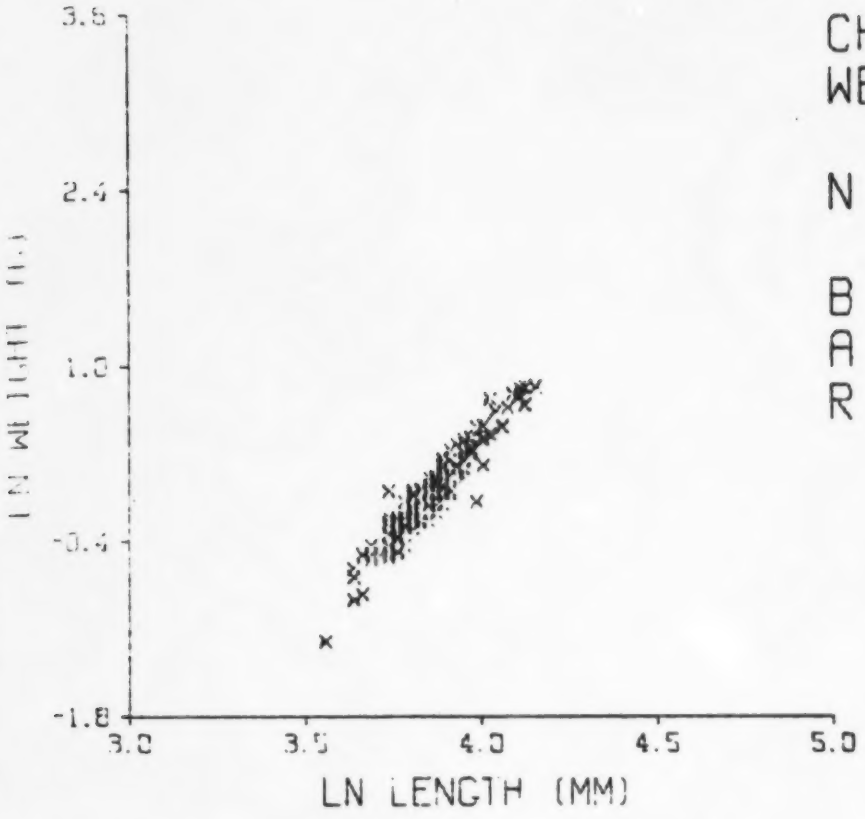

100
75
50
25
0
20
45
70
95
120
145
170
% FREQUENCY
LENGTH (MM)

Fig. 10.


CHUM MF BS
WEEK 6
N = 185
B = 3.06
A =-11.84
R =0.9497
LN LENGTH (MM)

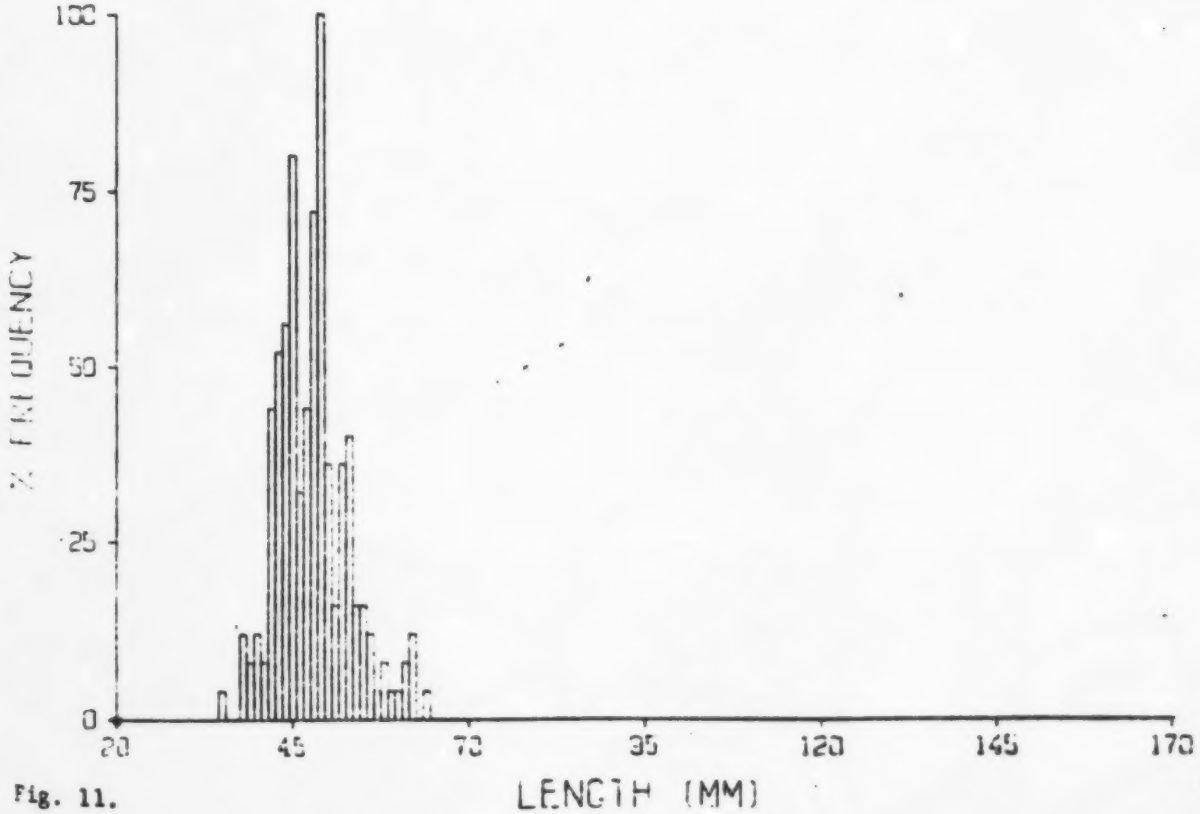
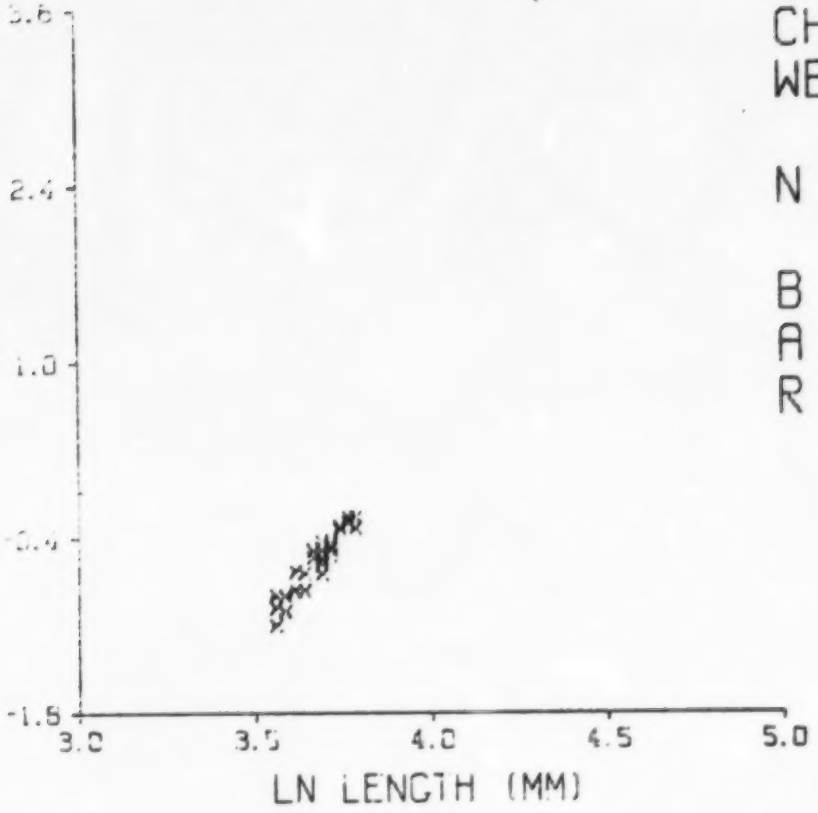

% FREQUENCY
LENGTH (MM)

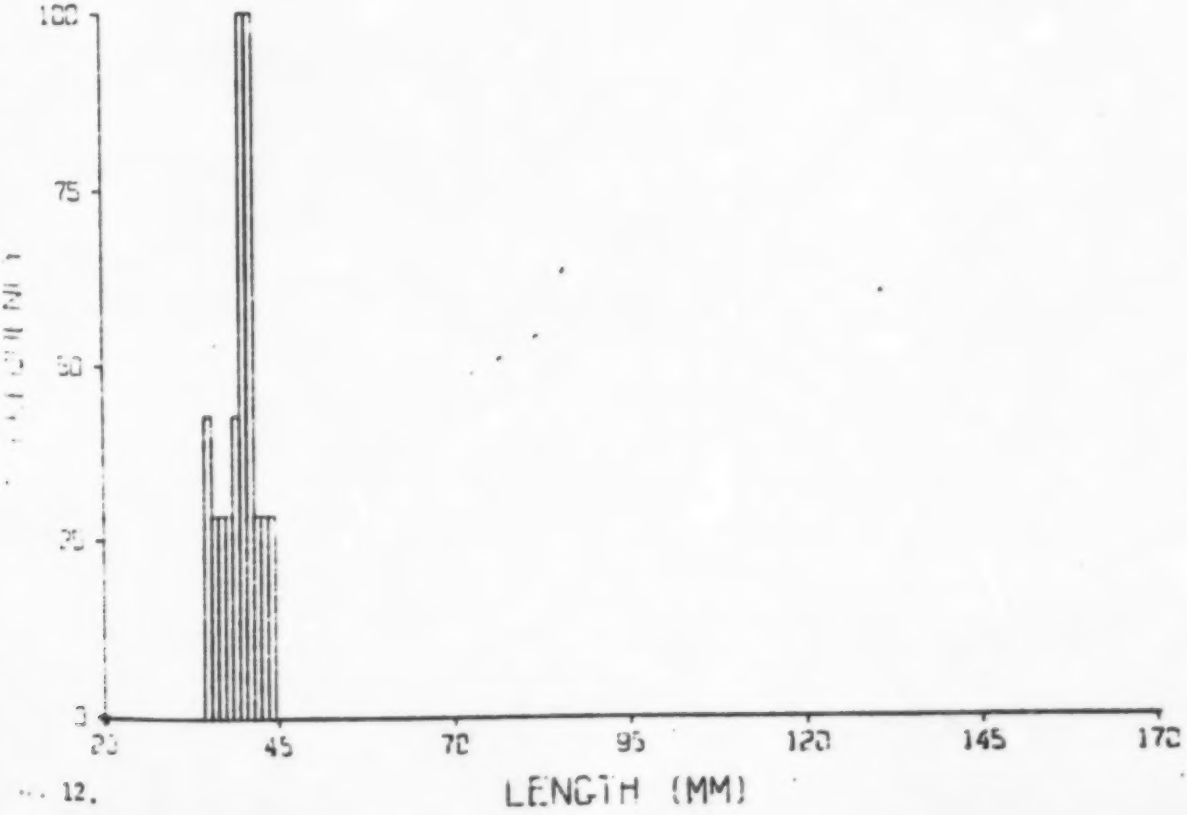
Fig. 11.

CHUM MF BS
WEEK 8

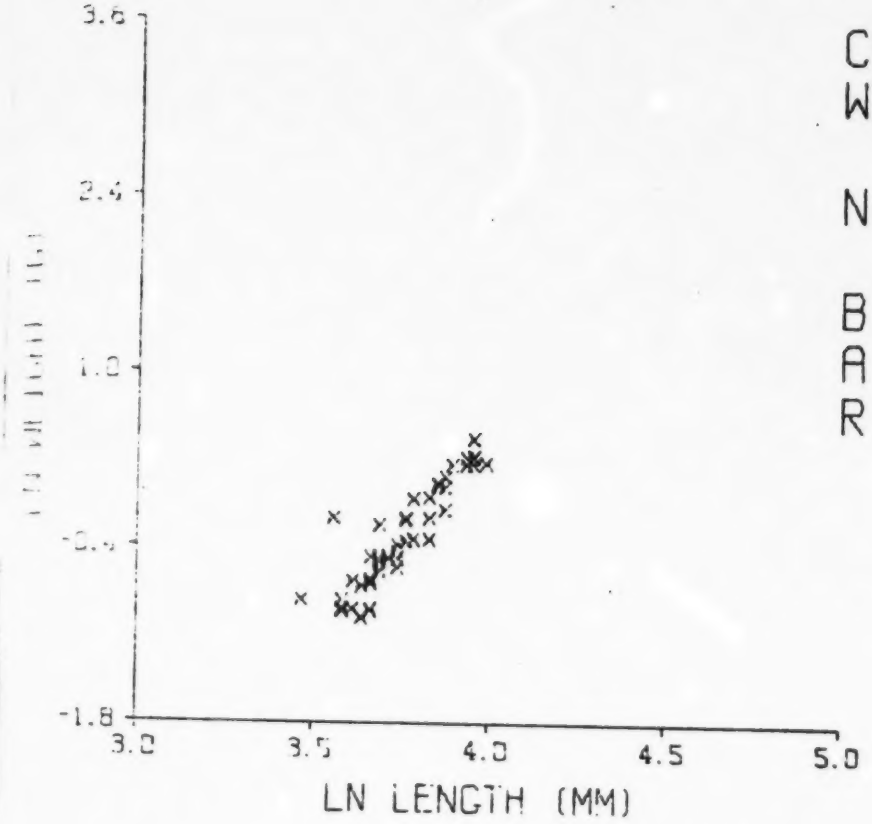
N = 32

B = 3.27
A =-12.61
R =0.9416





... 12.


CHUM MF BS
WEEK 9
N = 50
B = 3.02
A =-11.65
R =0.9050
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

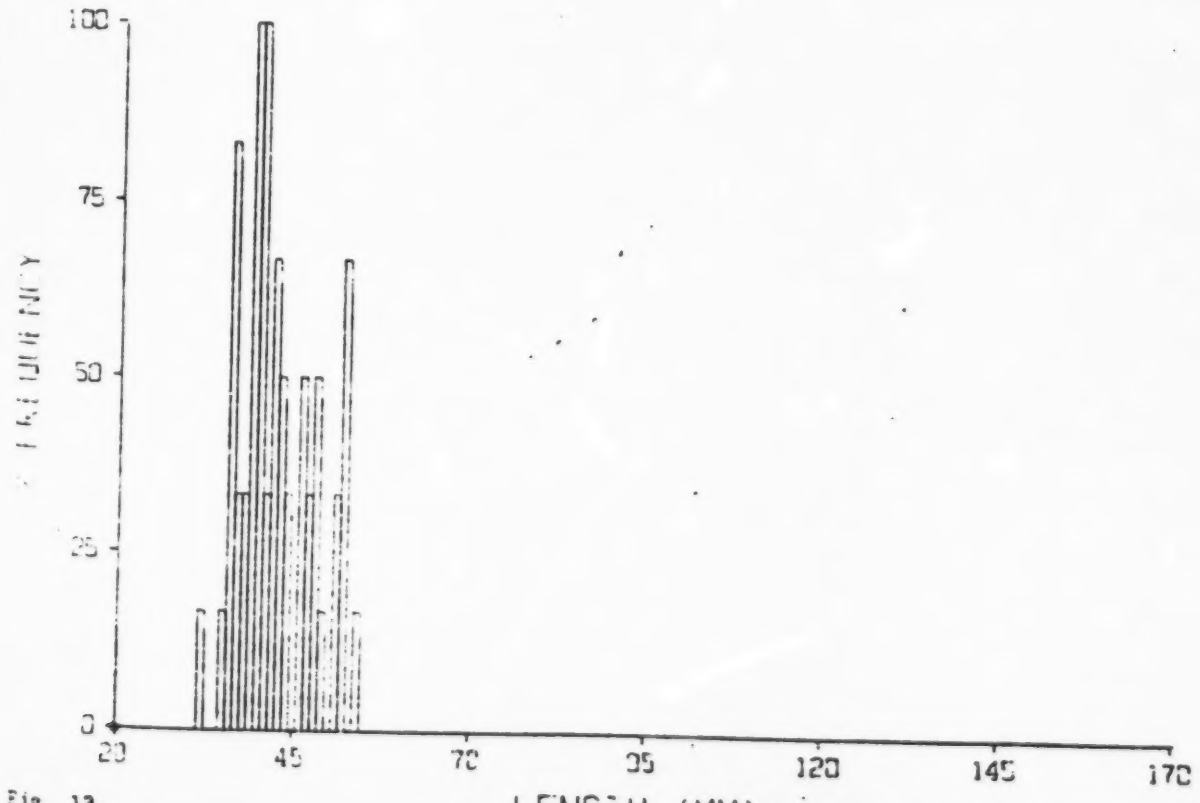
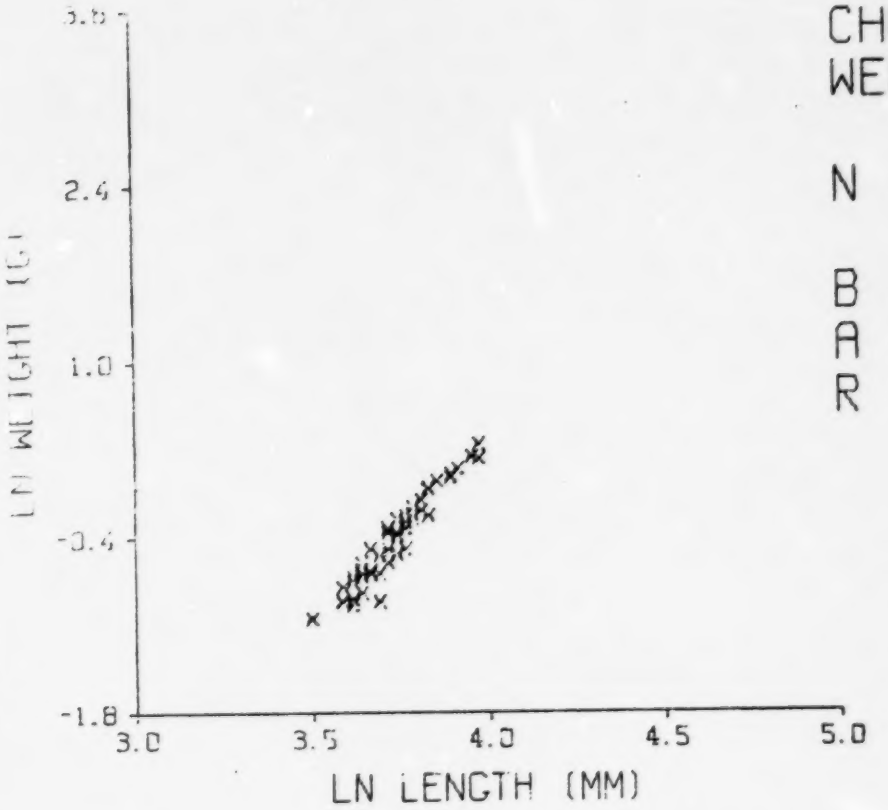

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 13.


CHUM MF BS
WEEK 10
N = 69
B = 3.24
A =-12.51
R =0.9575
LN WEIGHT (G)
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

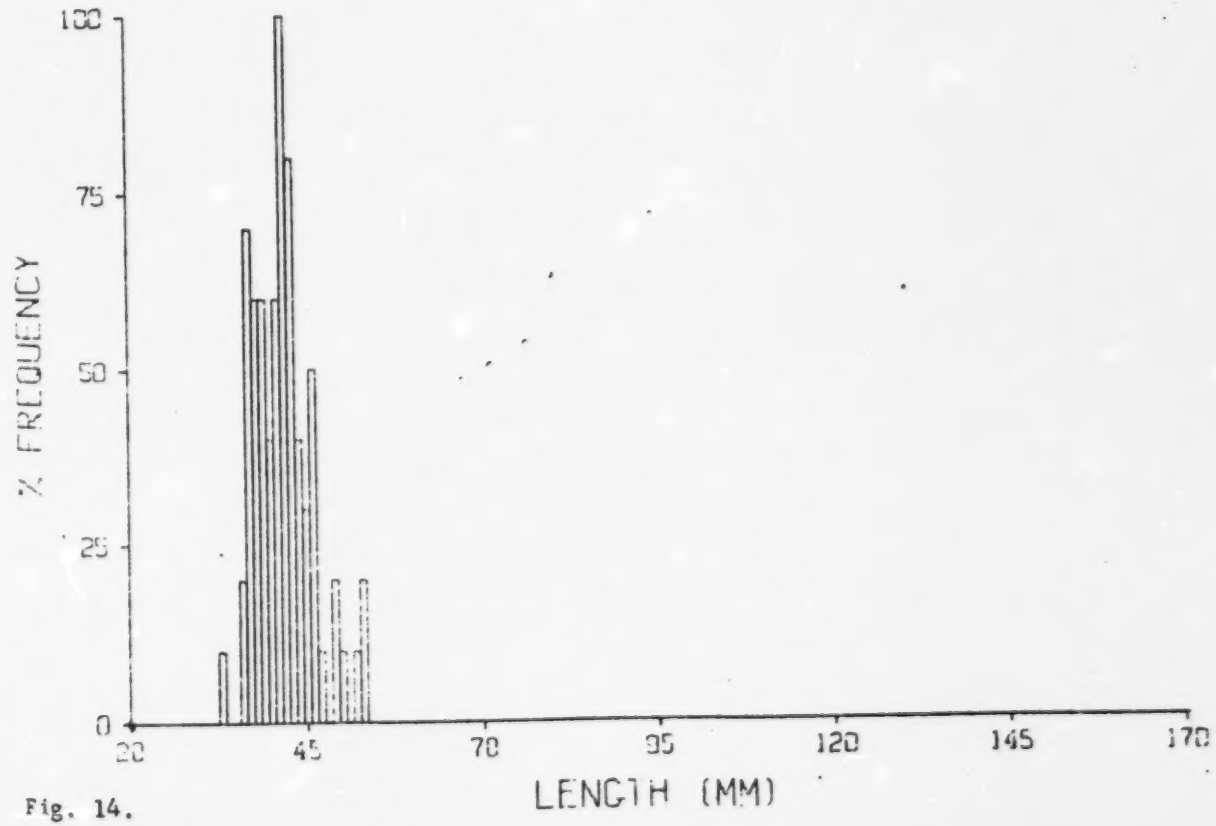
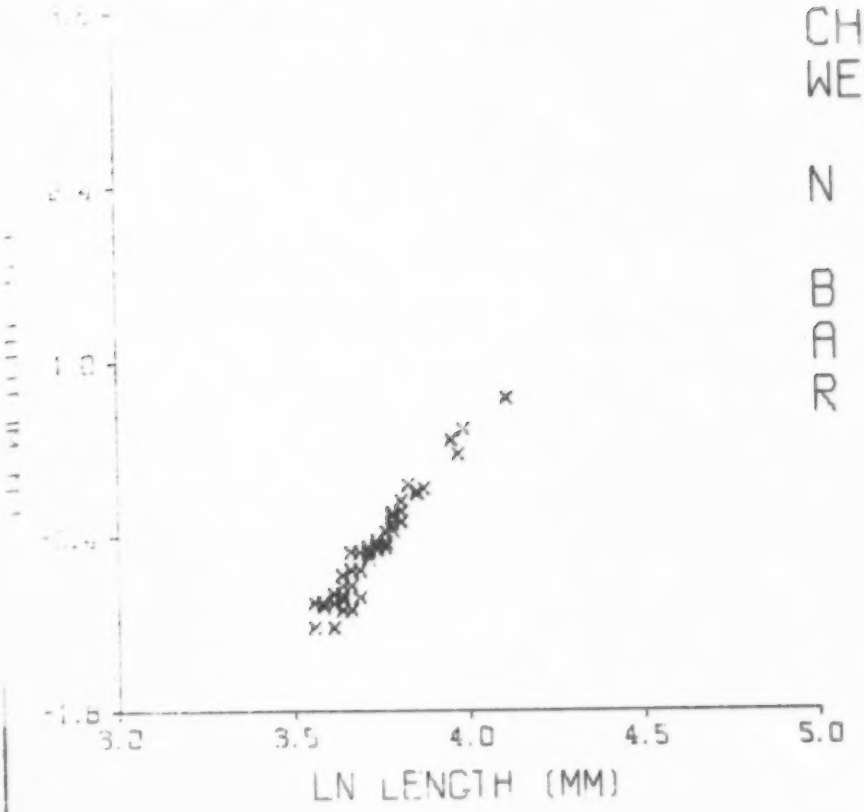

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 14.


CHUM MF BS
WEEK 11
N = 50
B = 3.52
A =-13.62
R =0.9713
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

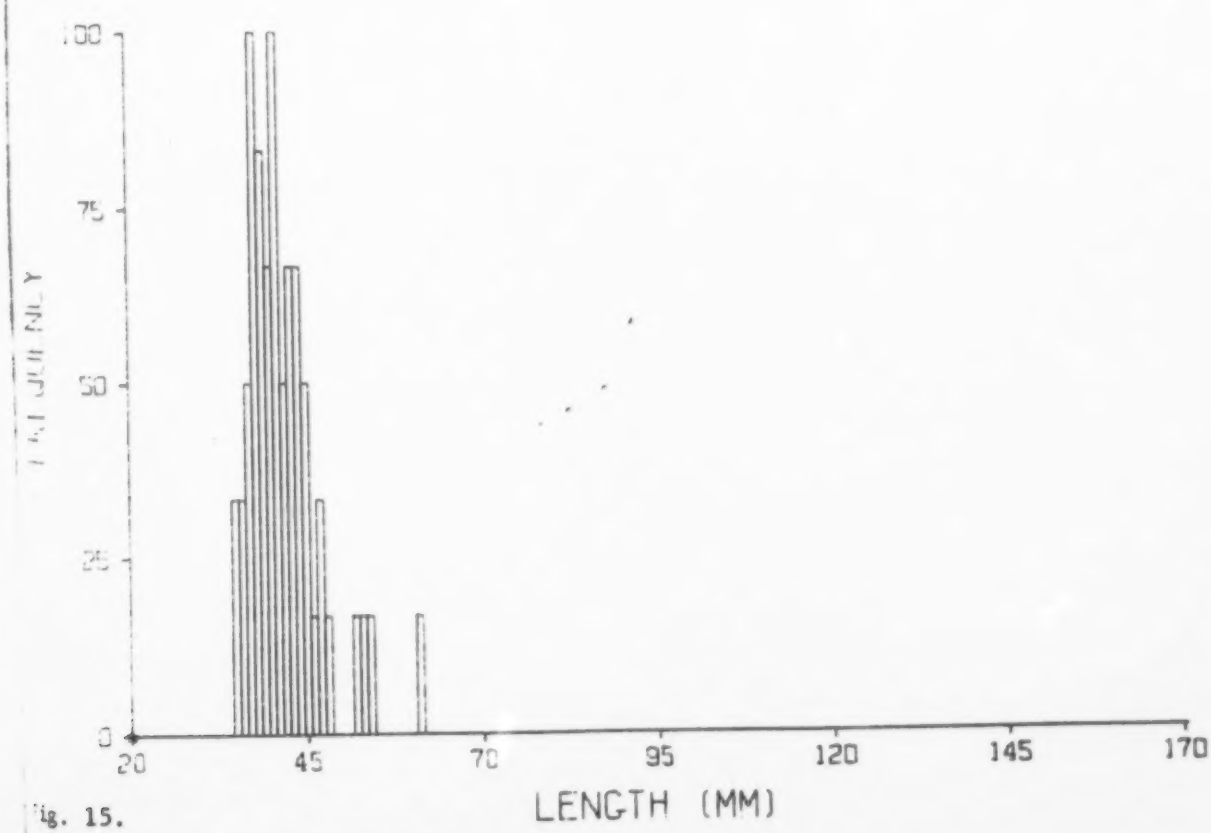
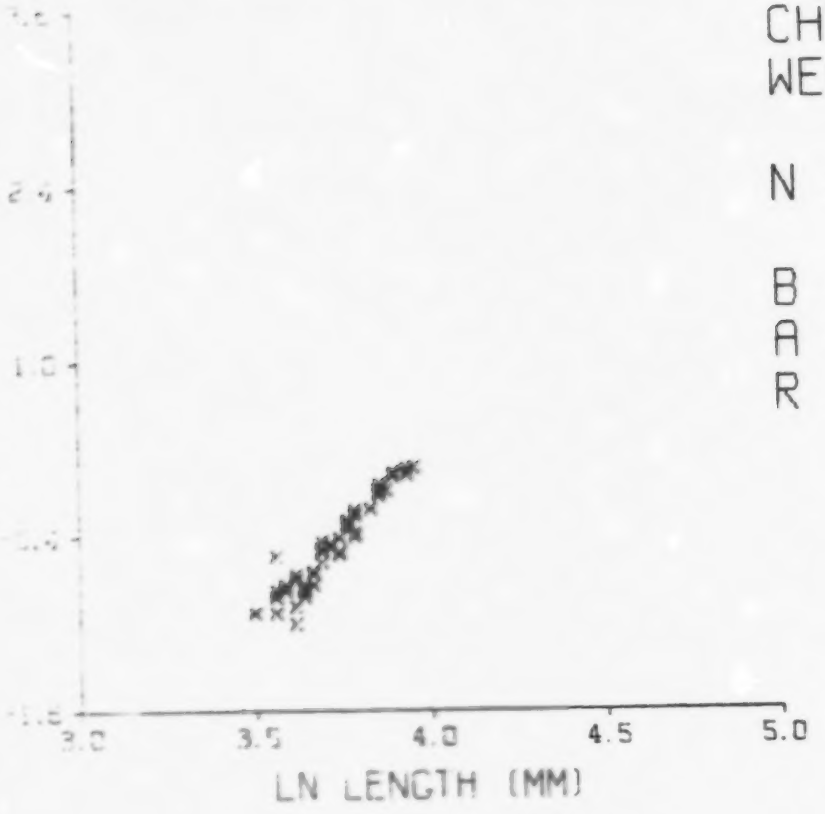

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 15.


CHUM MF BS
WEEK 12
N = 50
B = 2.93
A =-11.37
R =0.9509
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

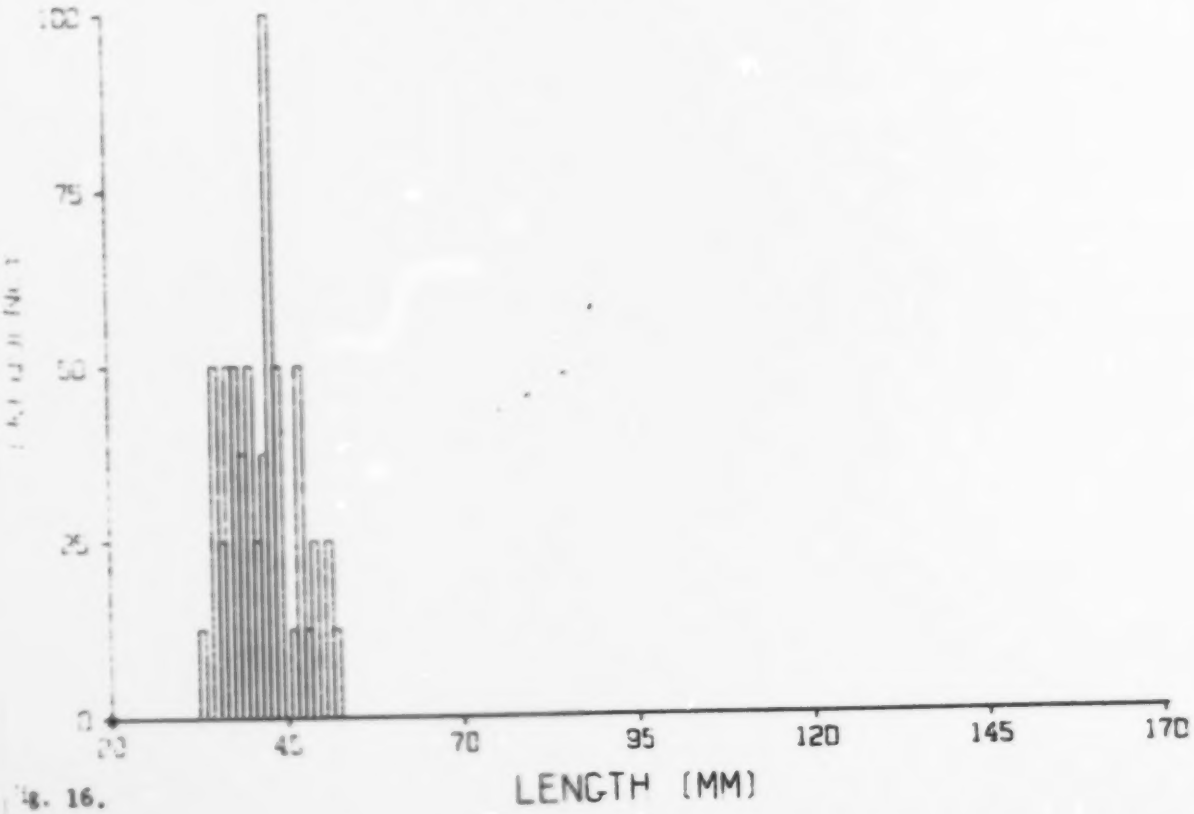
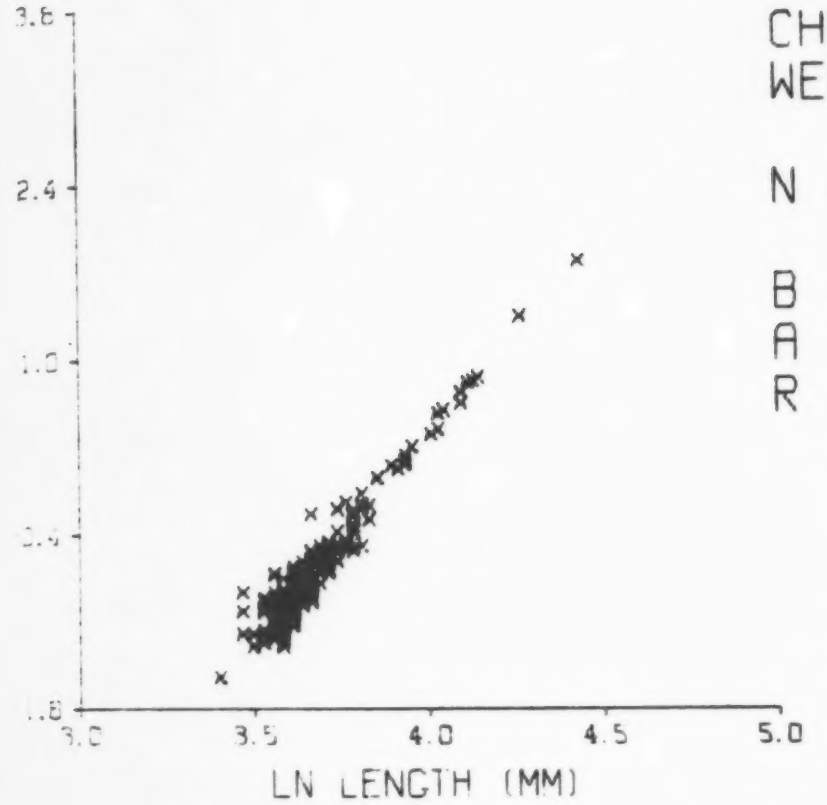

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 16.

Fig. 17-19. Length frequency, and length-weight relationship for chum captured by beach seine in areas other than the Nanaimo River mud flat during sampling Weeks 10 (11-17 May, Fig. 17), 11 (18-24 May, Fig. 18), 12 (25-31 May, Fig. 19).



CHUM SK BS
WEEK 10

N = 320

B = 3.28
A = -12.75
R = 0.9590

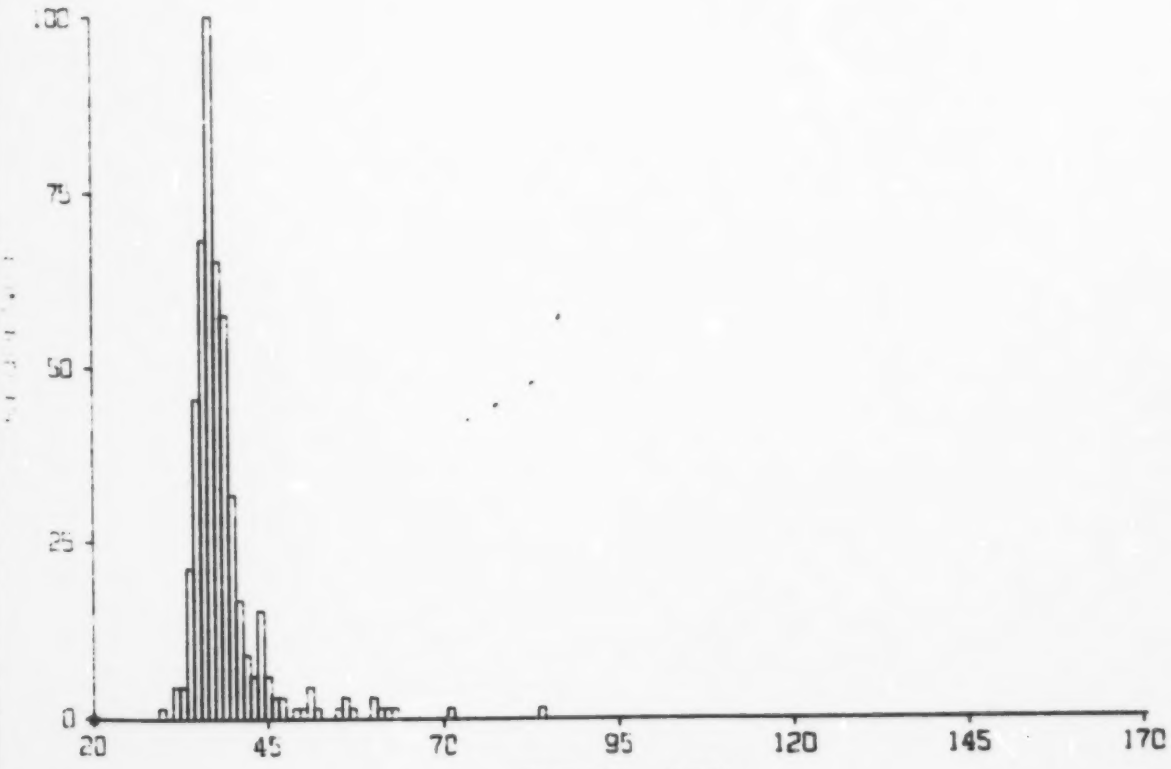
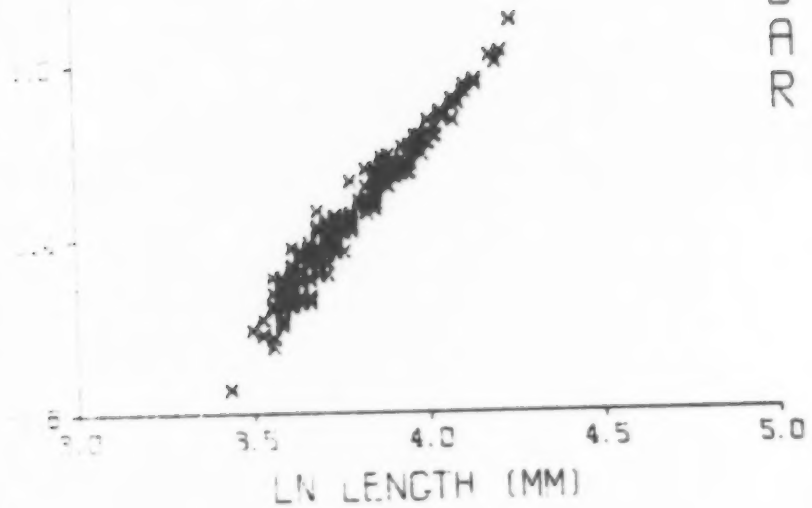


Fig. 17.

CHUM SK BS
WEEK 11

N = 201

B = 3.21
A = -12.39
R = 0.9763



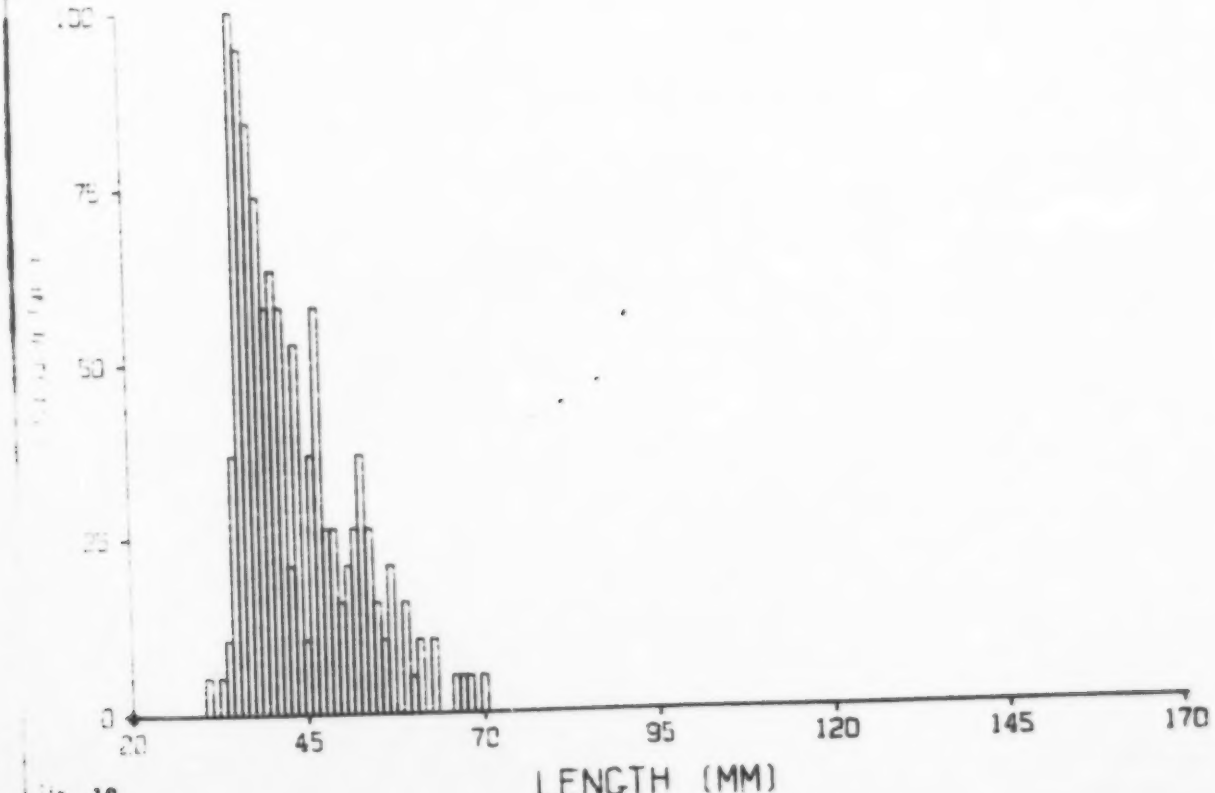
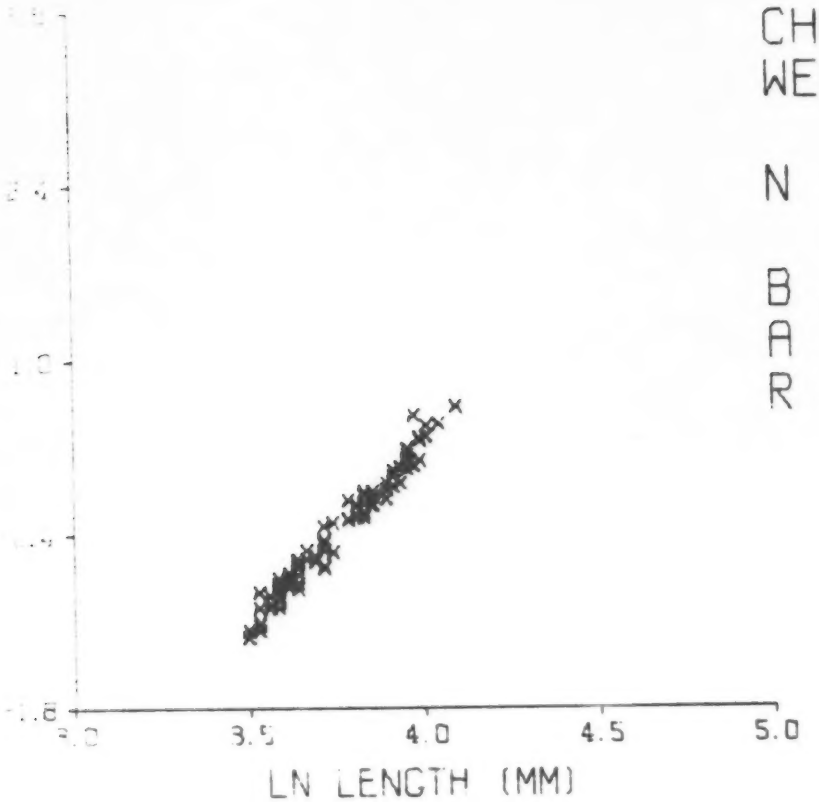


Fig. 18.


CHUM SK BS
WEEK 12
N = 100
B = 2.91
A =-11.28
R =0.9836
3.5
4.0
4.5
5.0
LN LENGTH (MM)

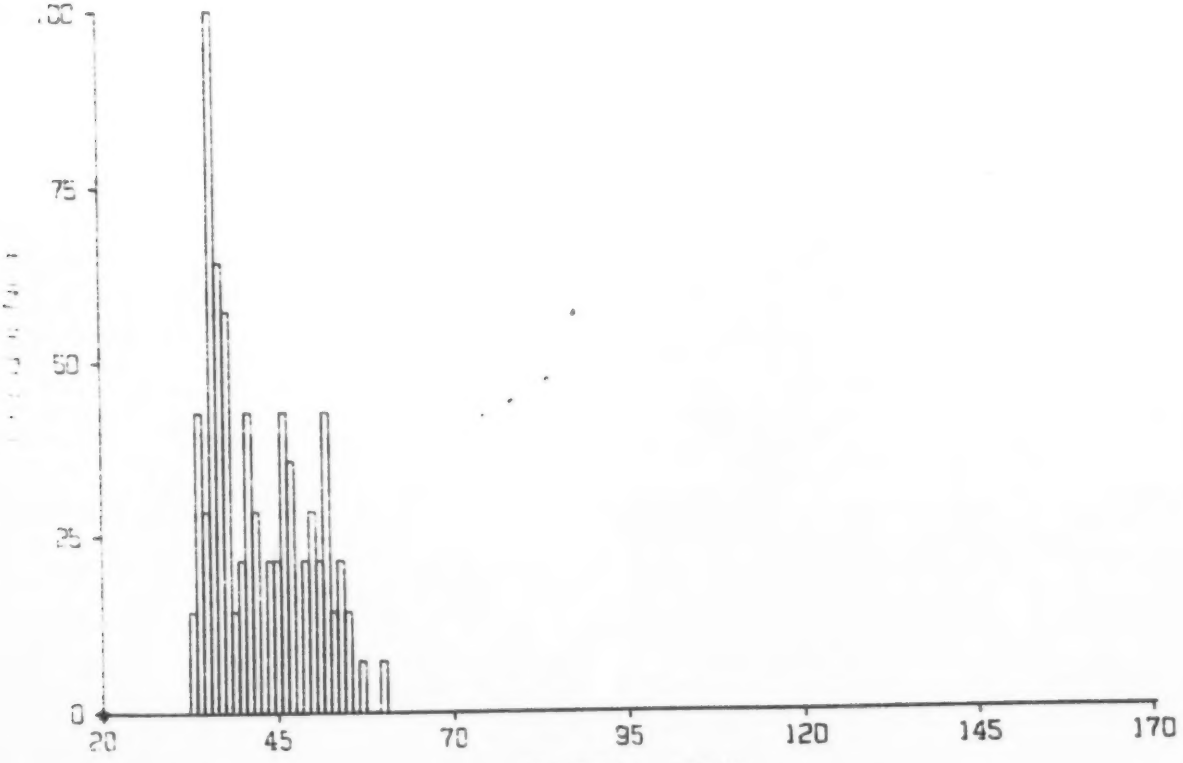
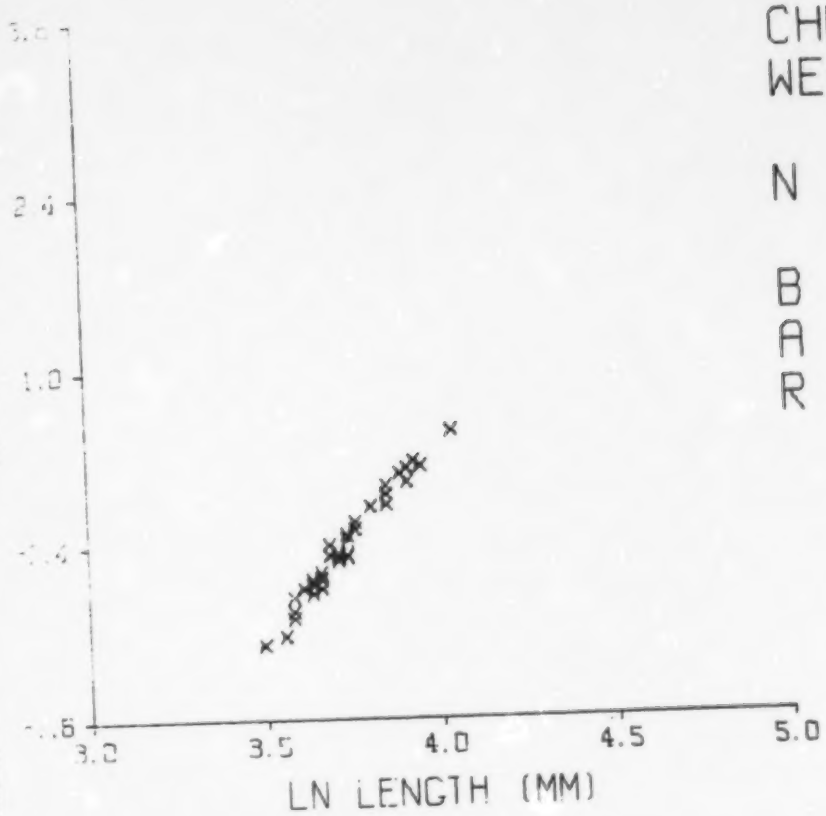

75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 19.

Fig. 20-30. Length frequency, and length-weight relationship for chum captured by the 50 fathom purse seine between sampling Weeks 8 (Fig. 20) and 18 (Fig. 30).

Week 8 = 27 April - 3 May
Week 9 = 4-10 May
Week 10 = 11-17 May
Week 11 = 18-24 May
Week 12 = 25-31 May
Week 13 = 1-7 June
Week 14 = 8-14 June
Week 15 = 15-21 June
Week 16 = 22-28 June
Week 17 = 29 June - 5 July
Week 18 = 6-12 July


CHUM M PS
WEEK 8
N = 36
B = 3.28
A =-12.66
R =0.9858
3.0
2.5
2.0
1.5
1.0
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

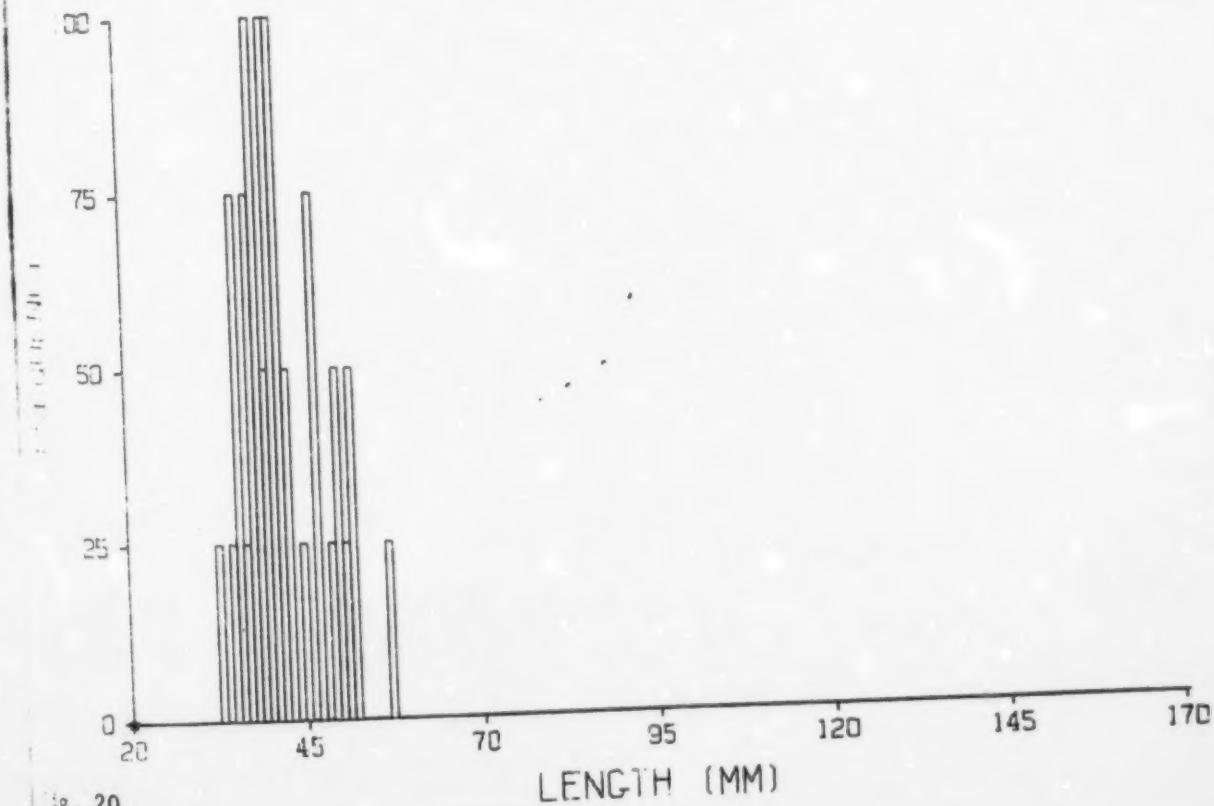
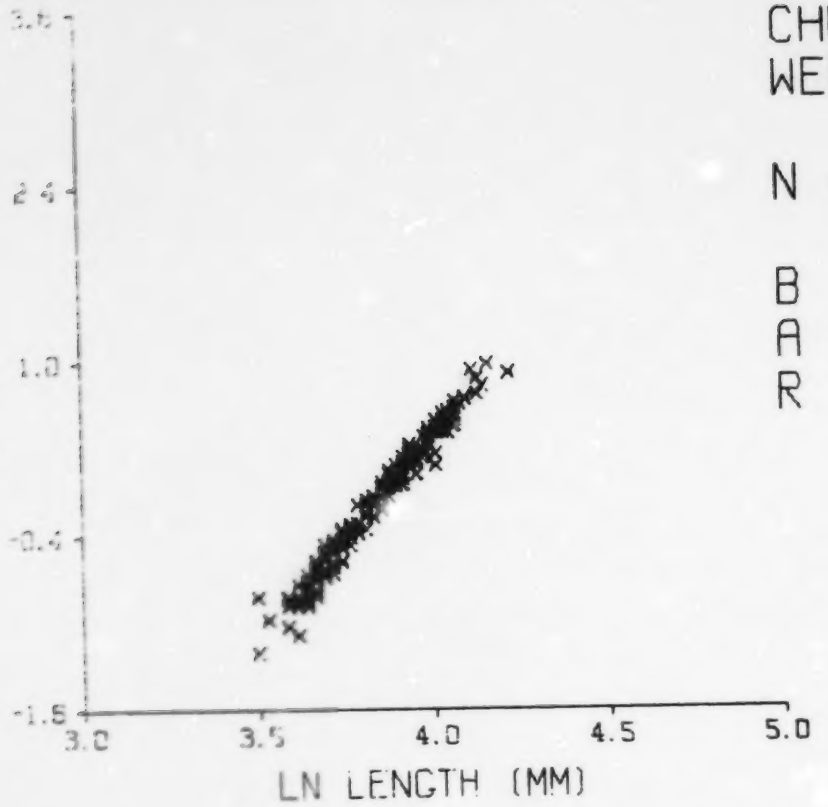

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 20.


CHUM M PS
WEEK 9
N = 204
B = 3.36
A =-13.05
R =0.9871
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

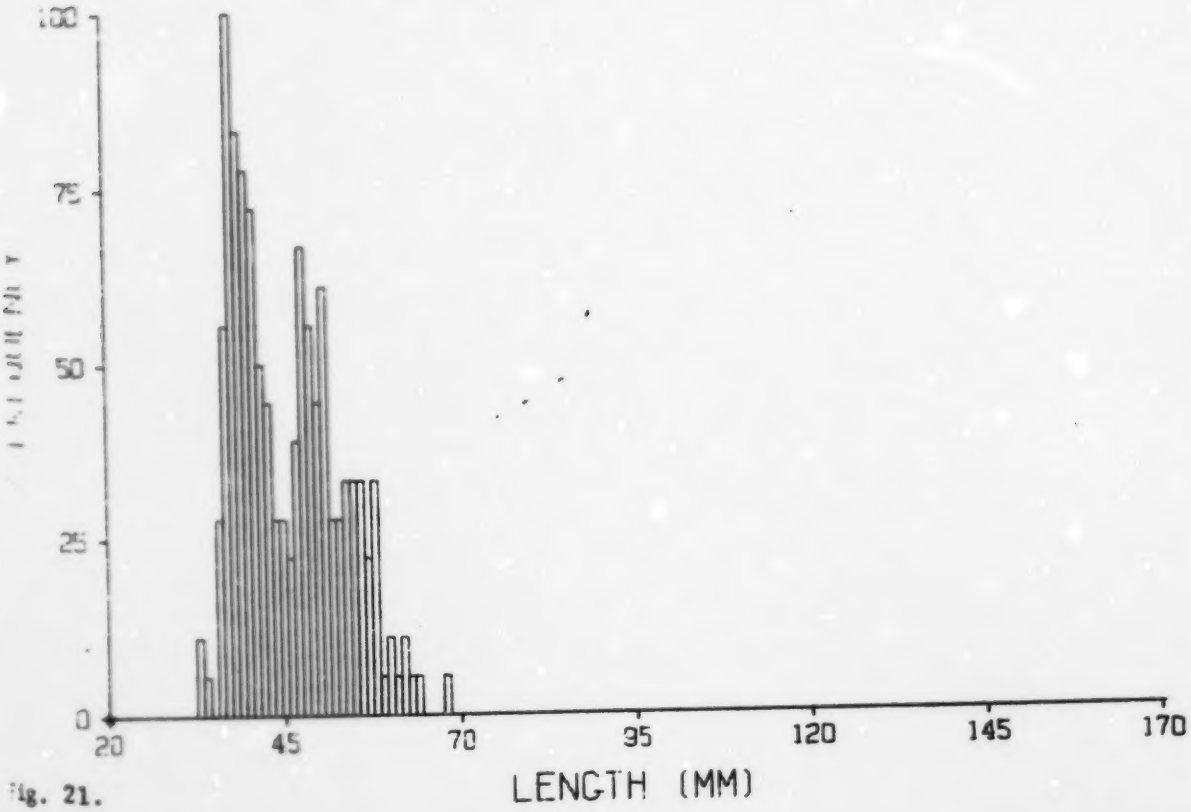
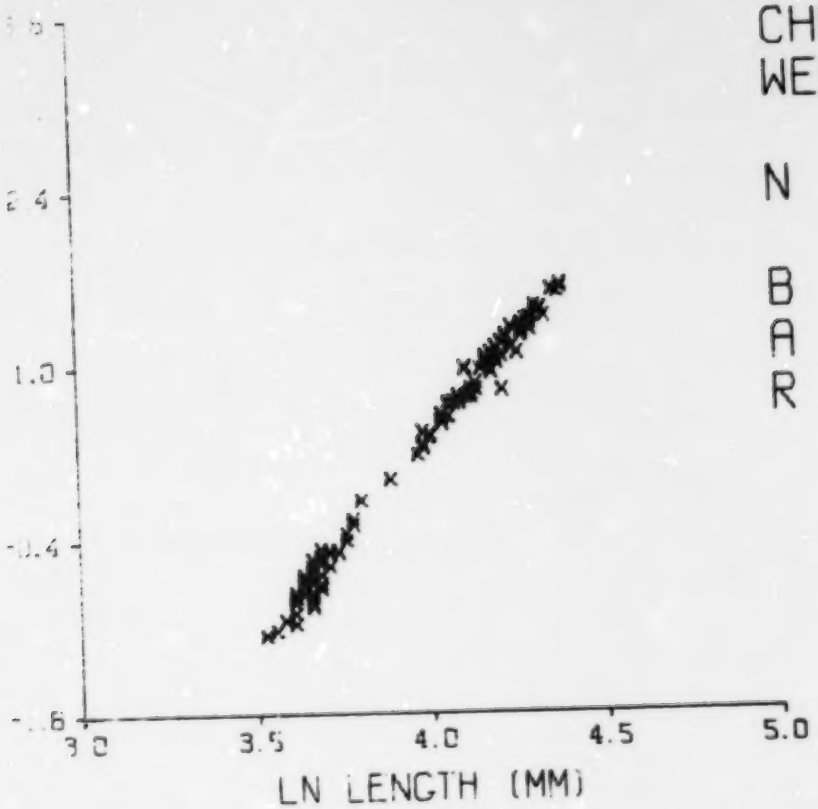

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 21.


CHUM M PS
WEEK 10
N = 126
B = 3.28
A =-12.74
R =0.9955
1.0
-0.4
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

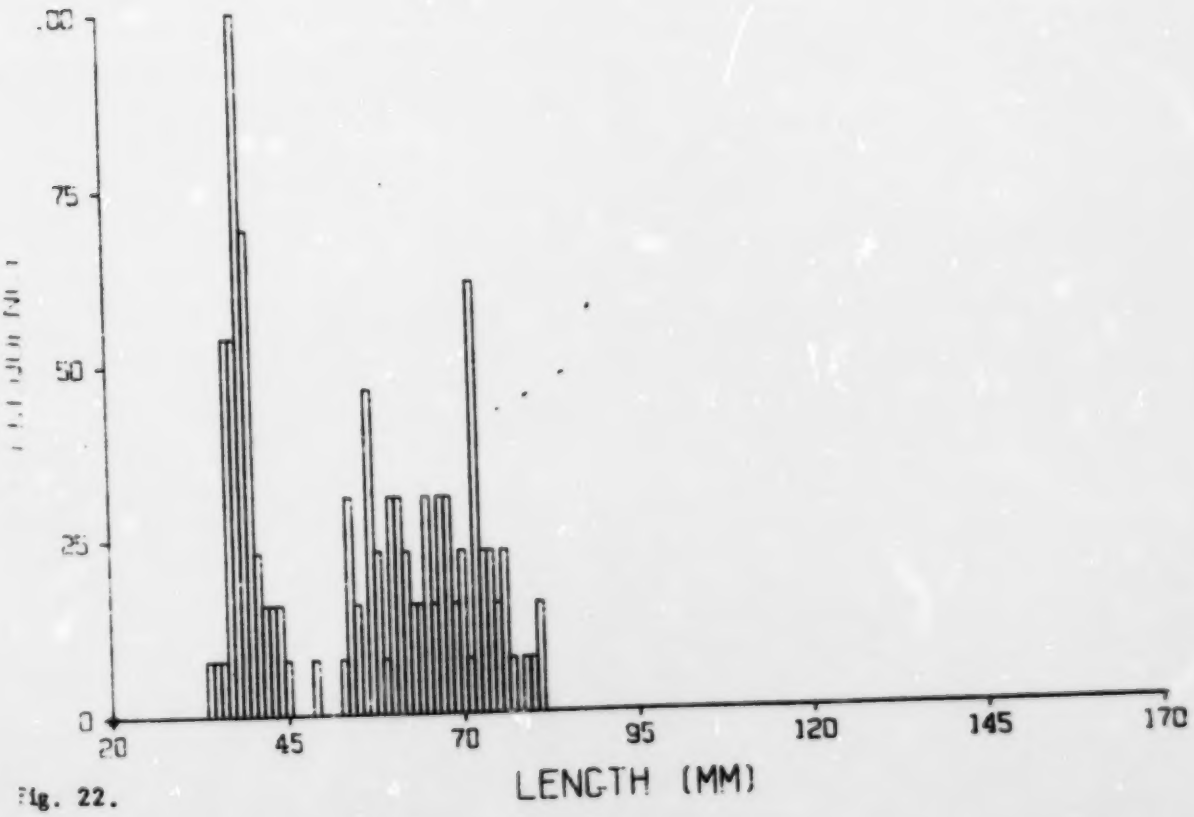
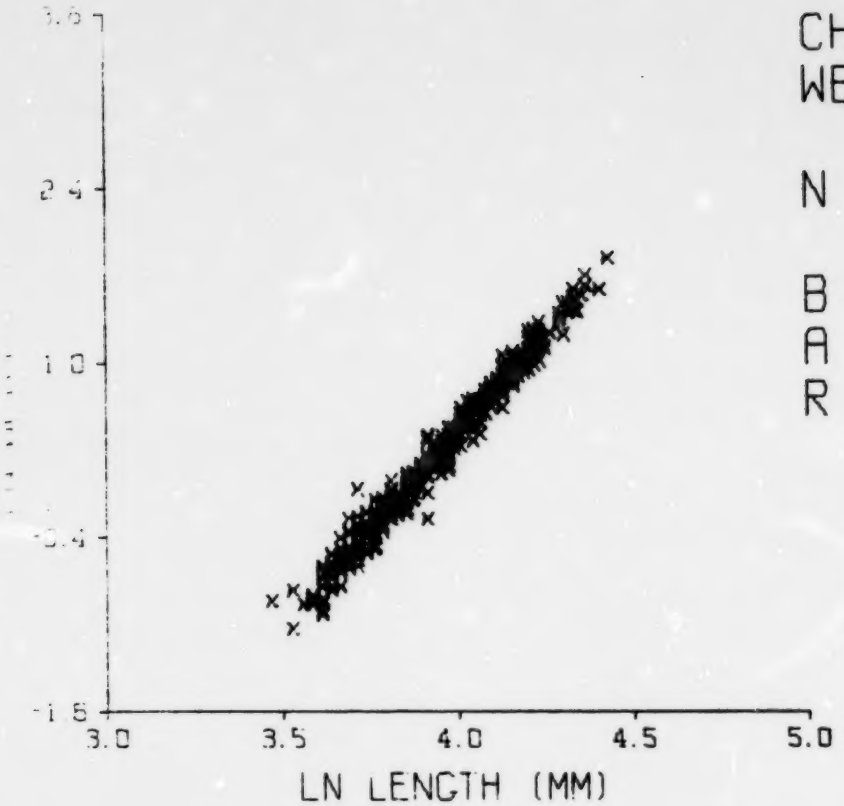

75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 22.


CHUM M PS
WEEK 11
N = 450
B = 3.12
A =-12.03
R =0.9887
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

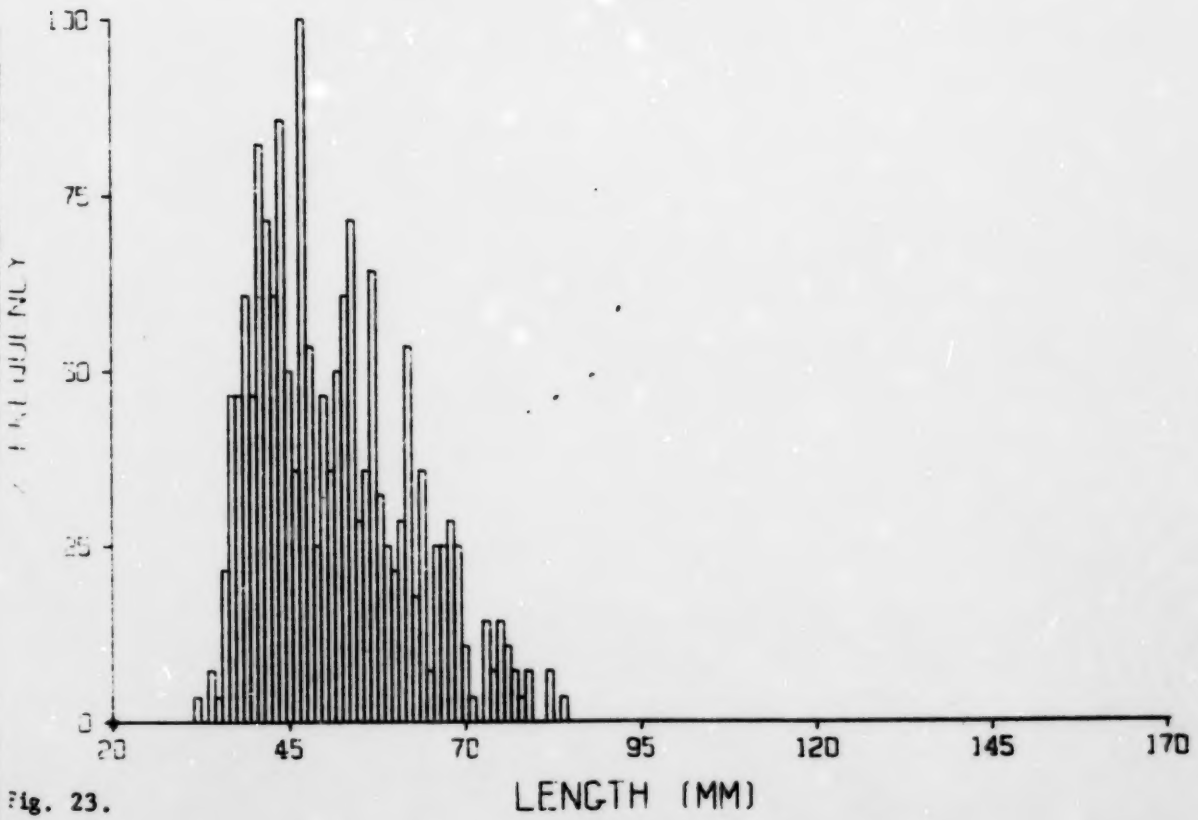
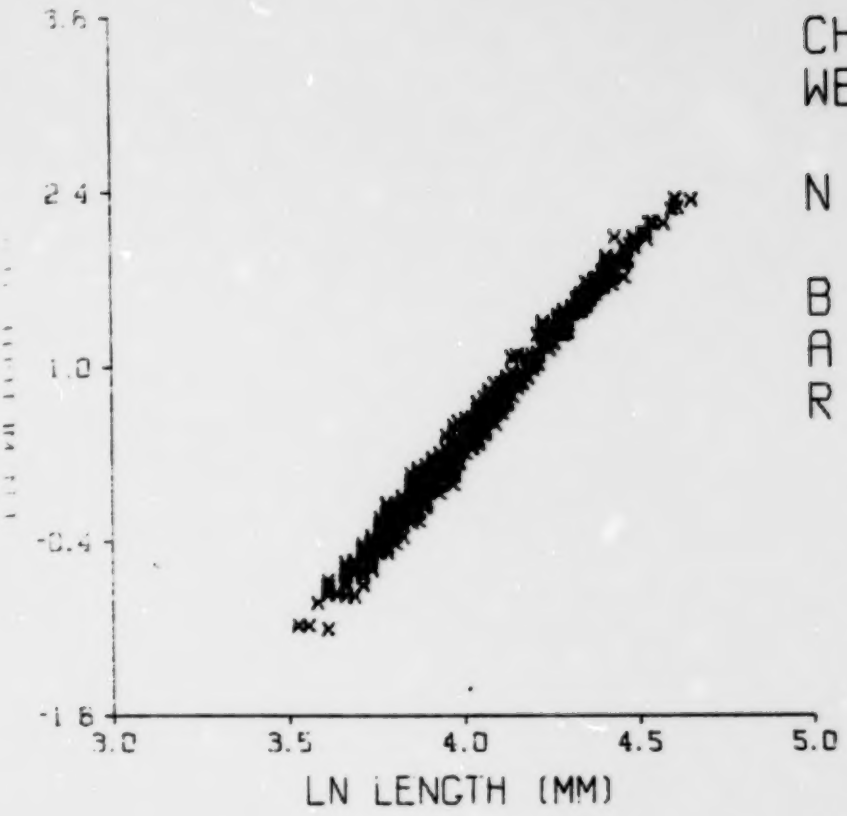

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 23.



CHUM M PS
WEEK 12

N = 600

B = 3.25
A =-12.60
R =0.9947

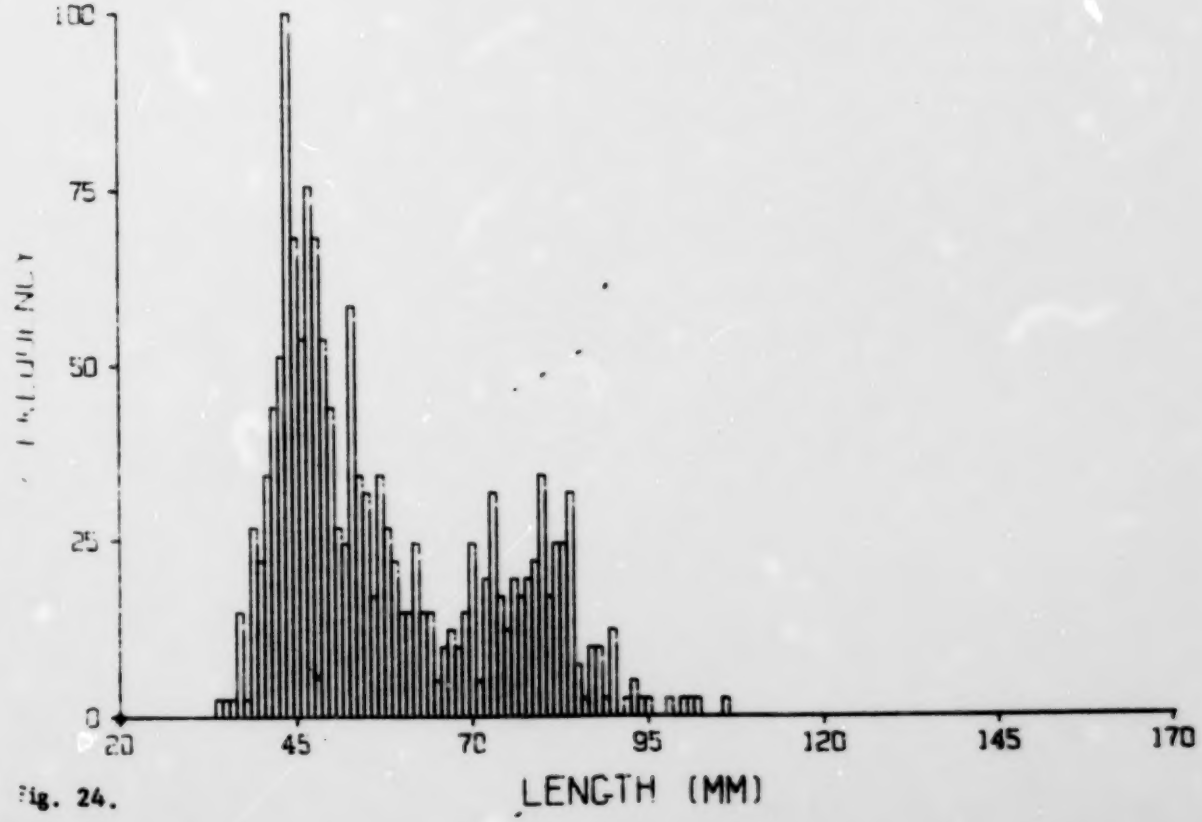
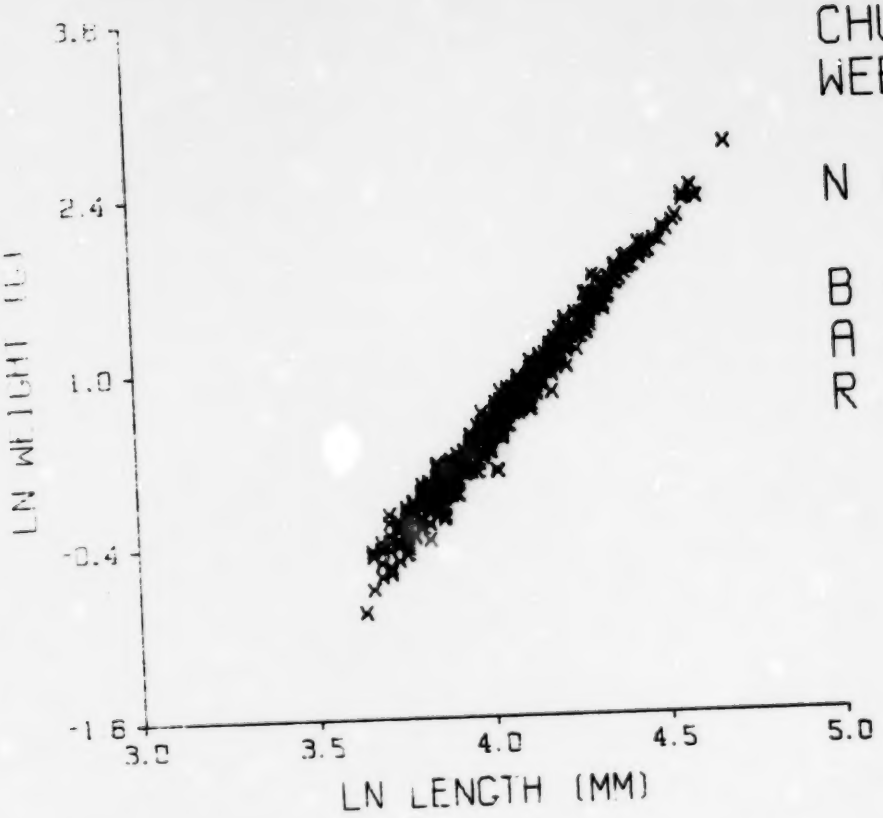


Fig. 24.


CHUM M PS
WEEK 13
N = 561
B = 3.14
A =-12.09
R =0.9892
LN WEIGHT (G)
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

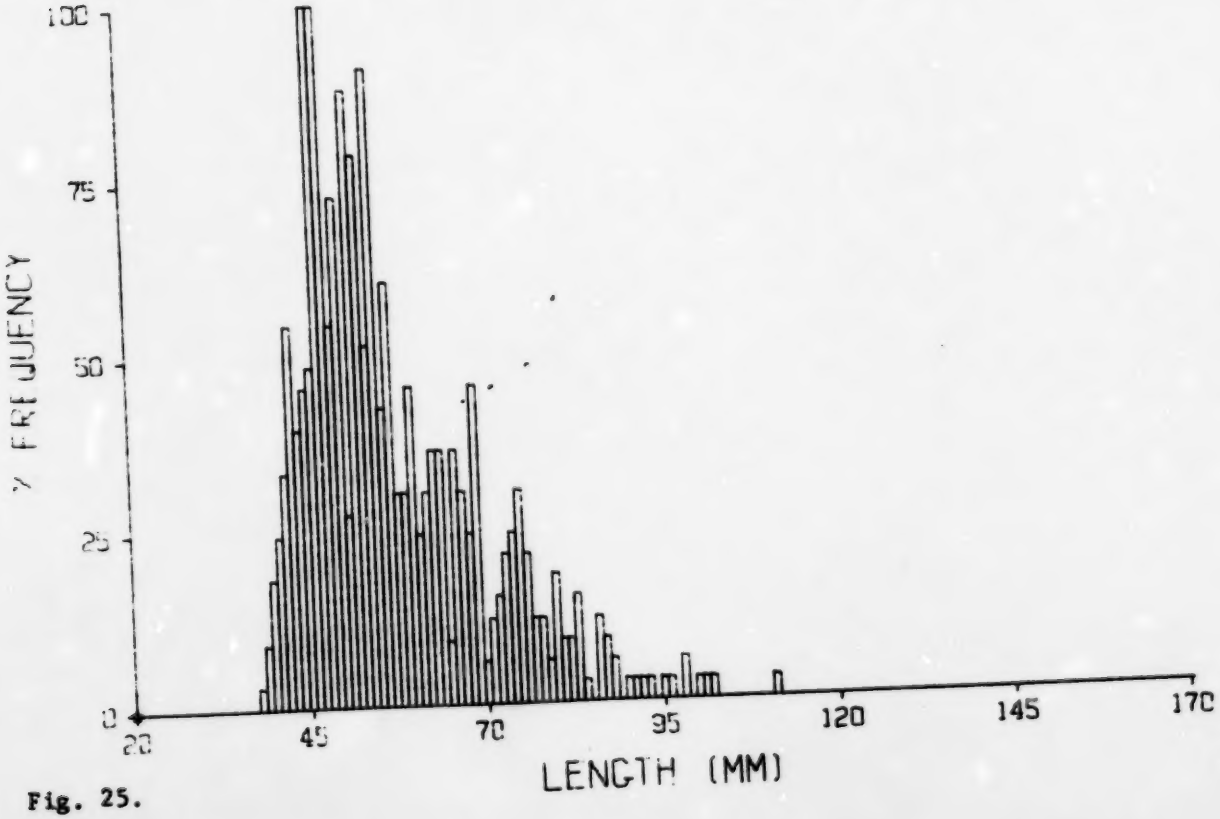
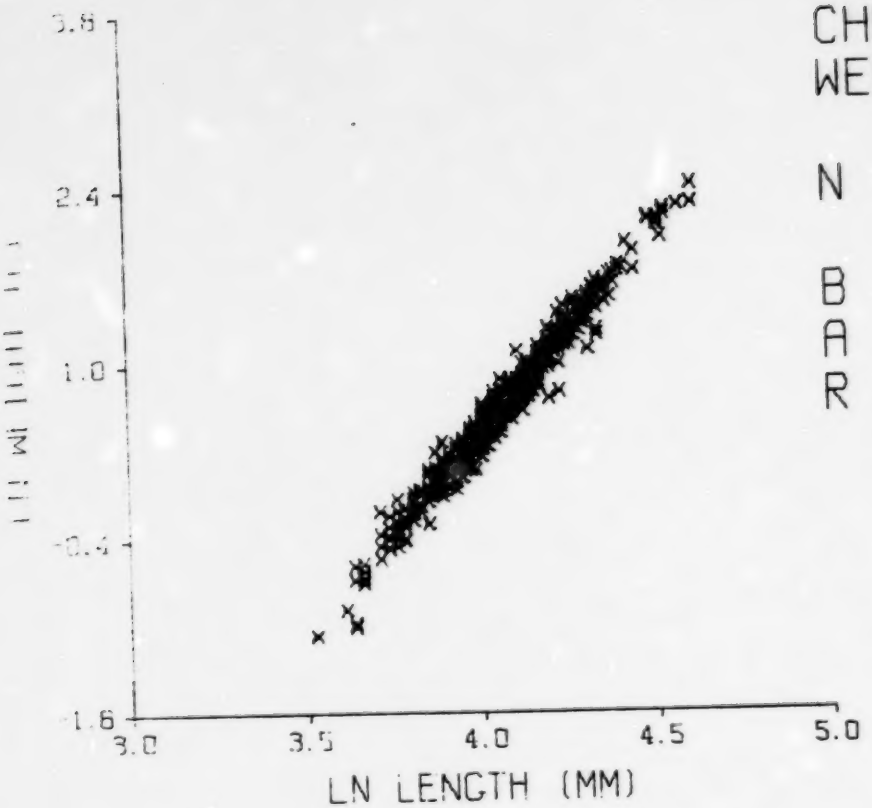

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 25.


CHUM M PS
WEEK 14
N = 648
B = 3.21
A =-12.39
R =0.9862
2.4
1.0
-0.4
-1.6
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

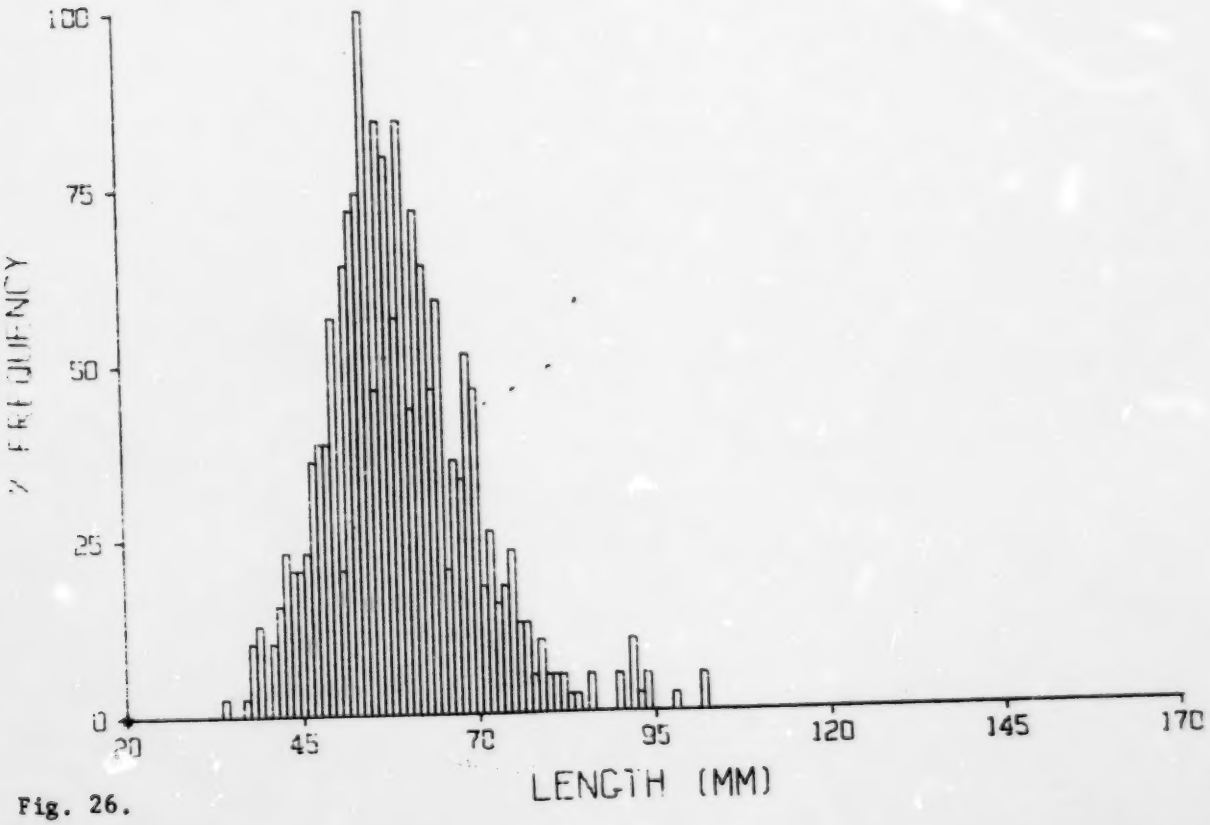
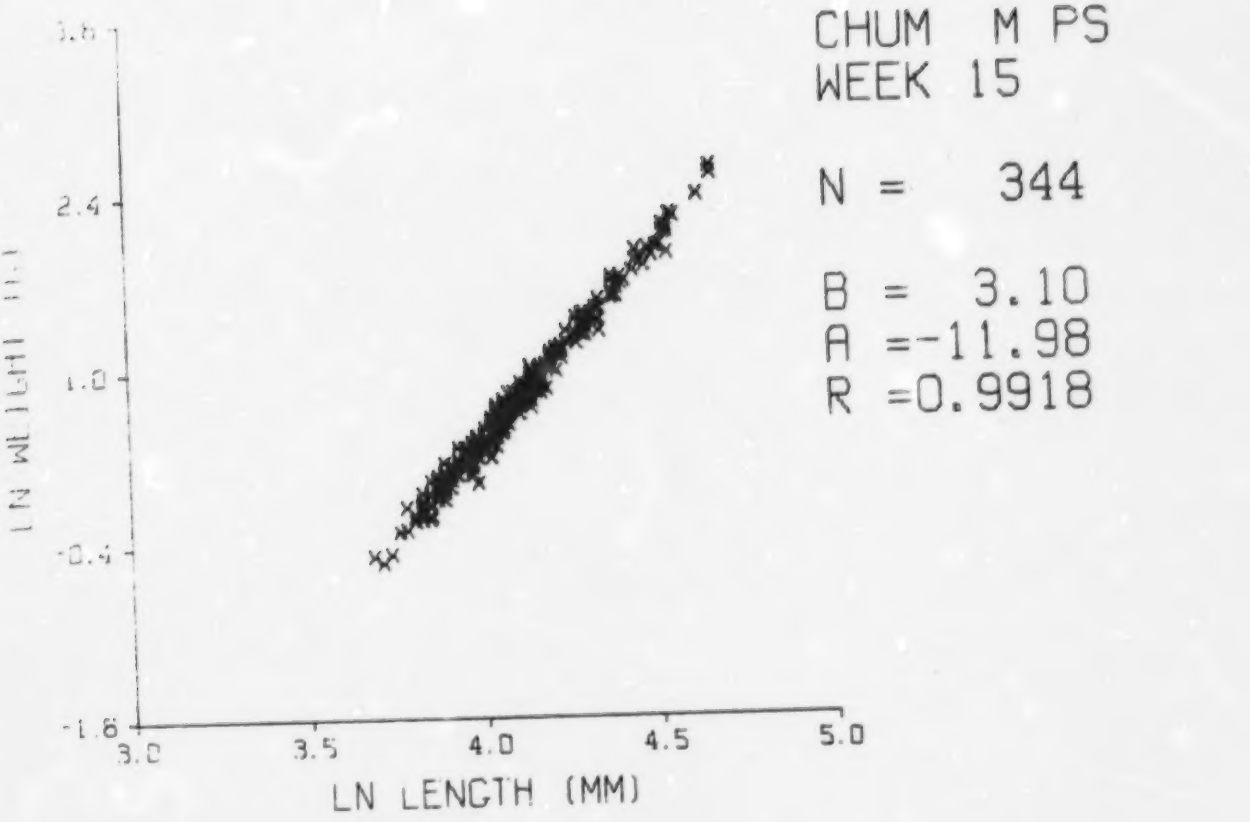

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 26.


CHUM M PS
WEEK 15
N = 344
B = 3.10
A =-11.98
R =0.9918
2.4
1.0
-0.4
-1.6
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

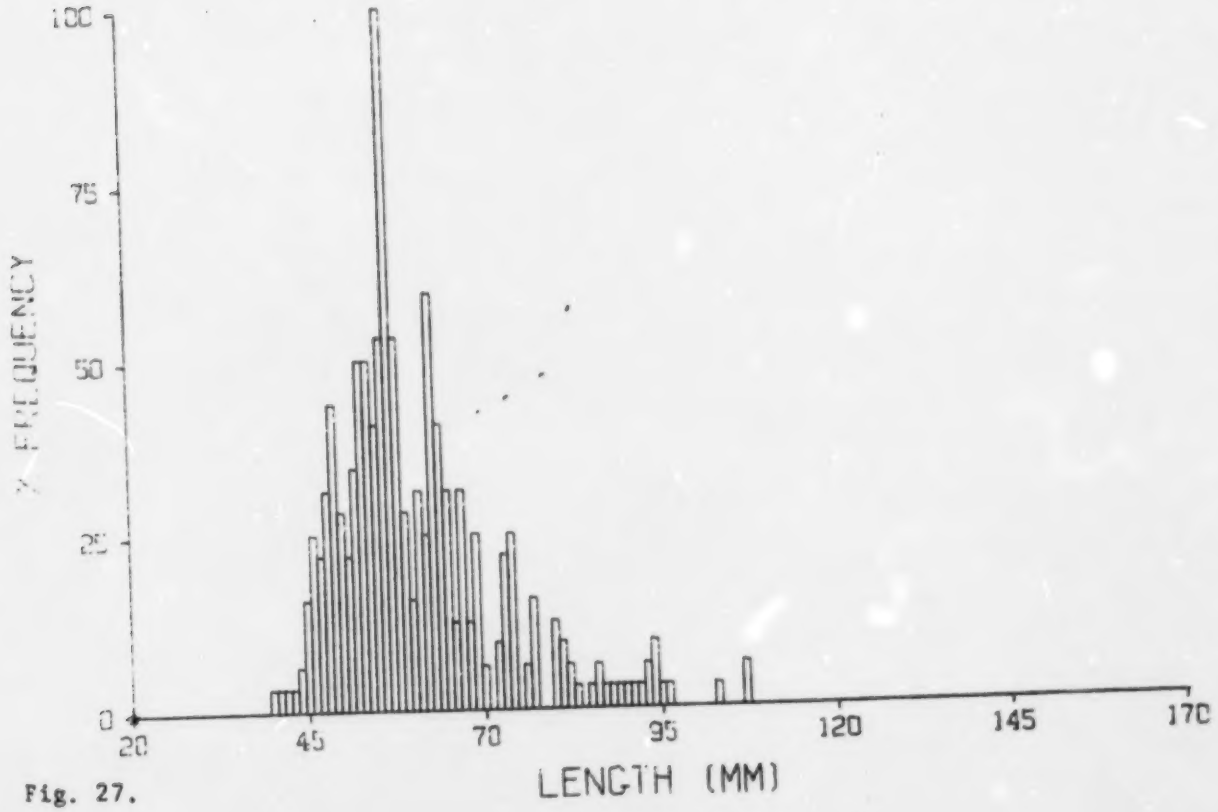
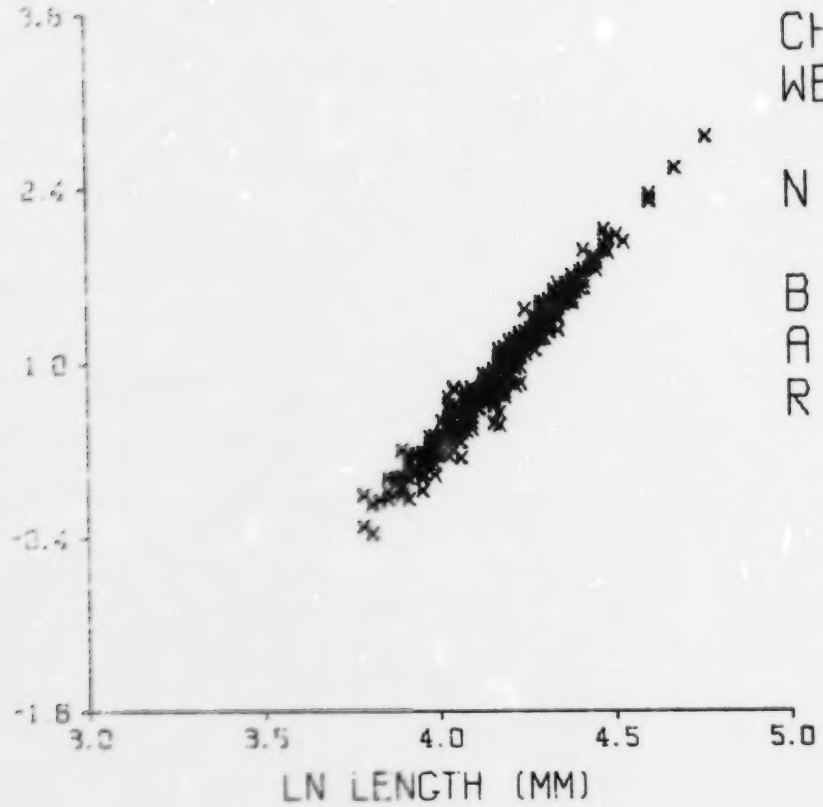
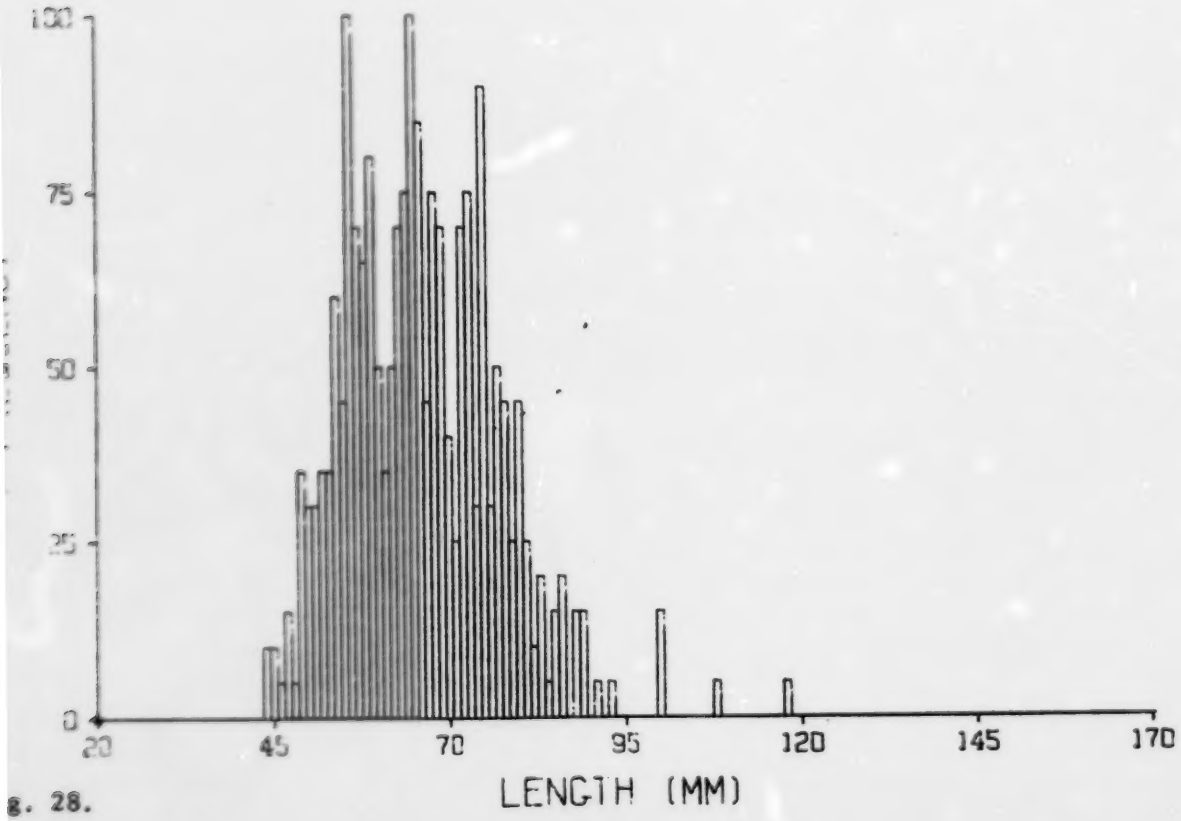
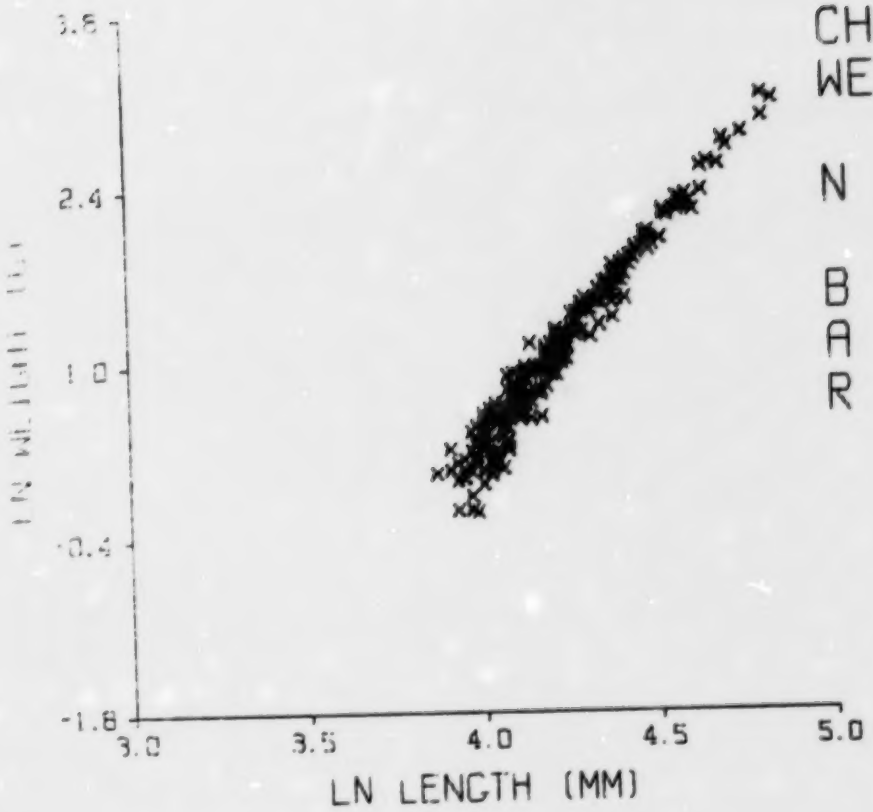

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 27.


CHUM M PS
WEEK 16
N = 394
B = 3.21
A =-12.46
R =0.9823
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)


100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

g. 28.


CHUM M PS
WEEK 17
N = 257
B = 3.37
A =-13.12
R =0.9806
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

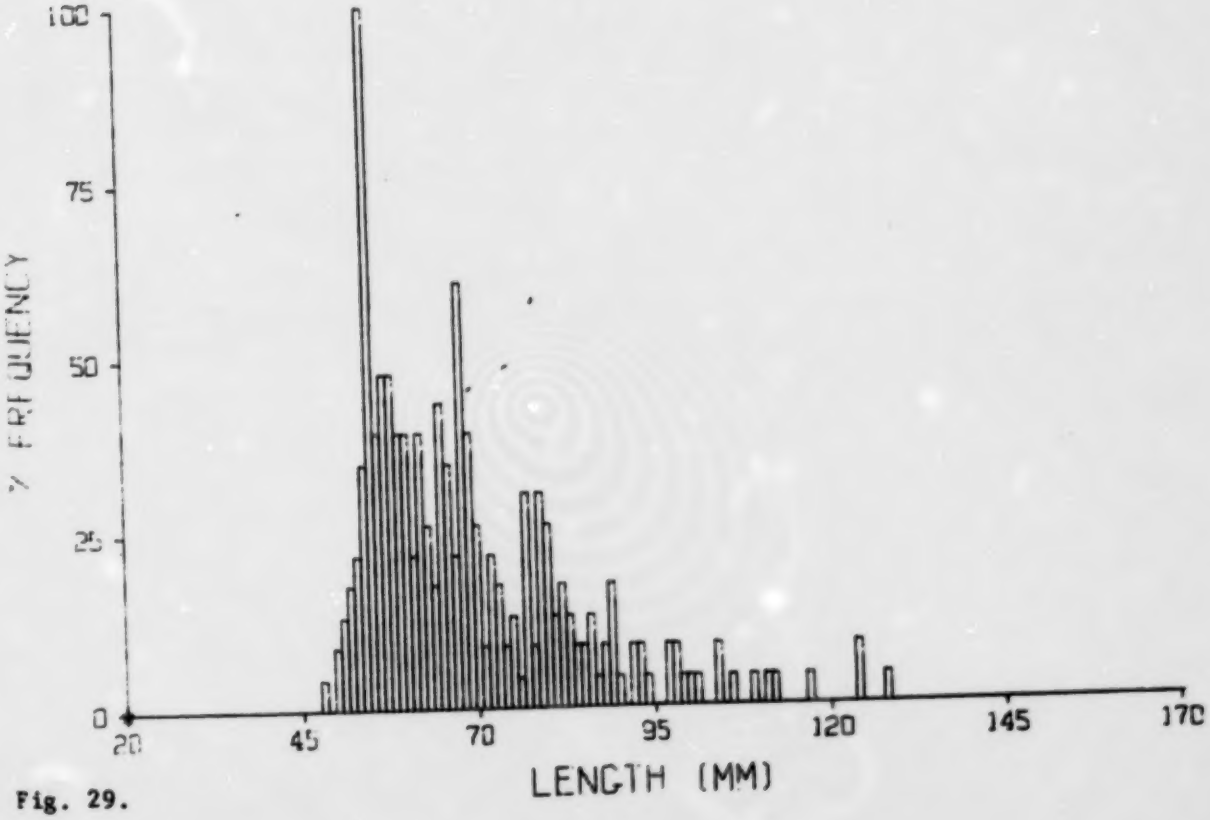
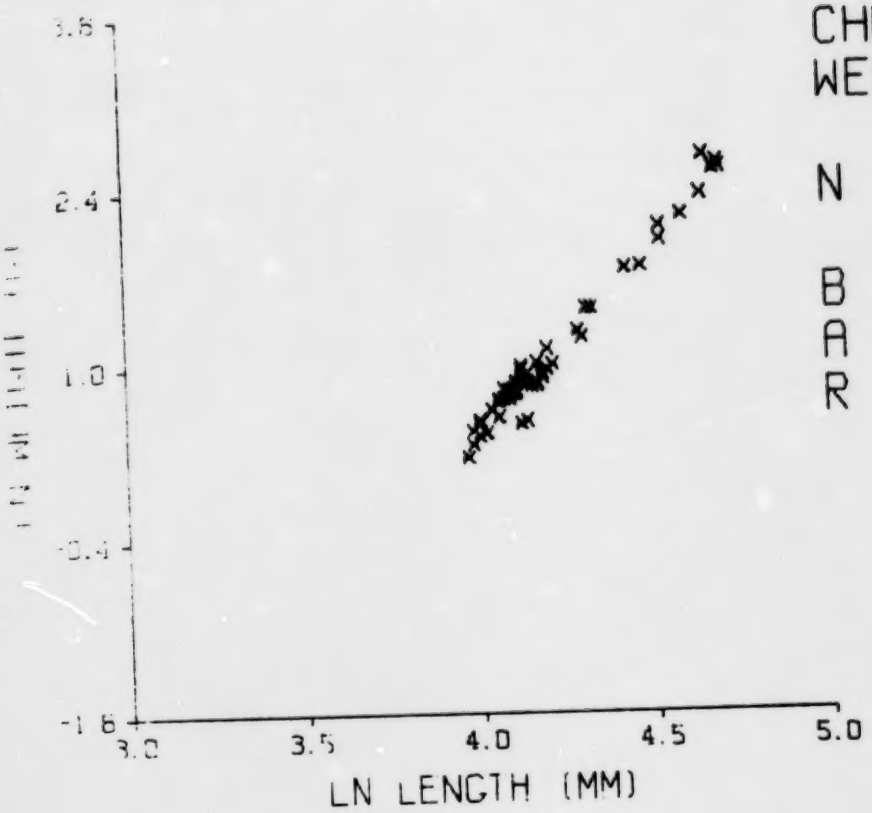

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 29.


CHUM M PS
WEEK 18
N = 53
B = 3.02
A =-11.62
R =0.9877
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

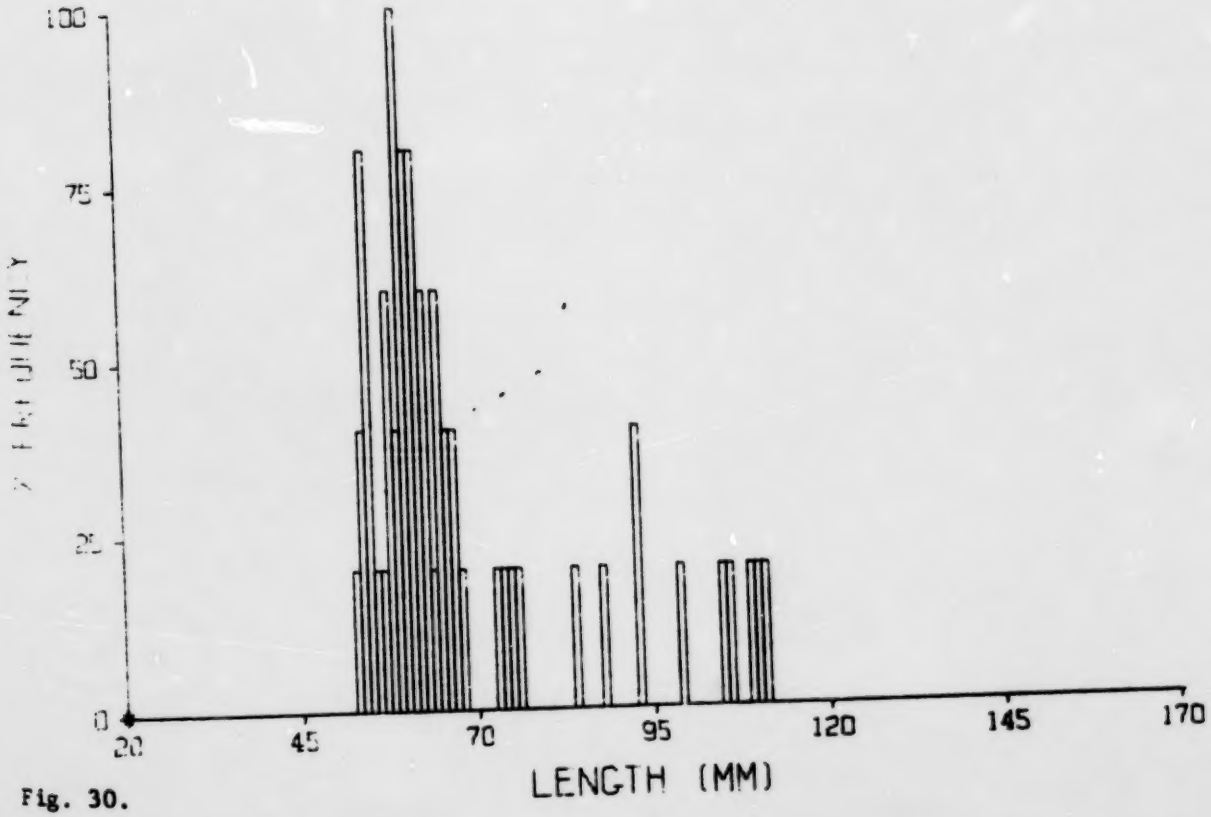
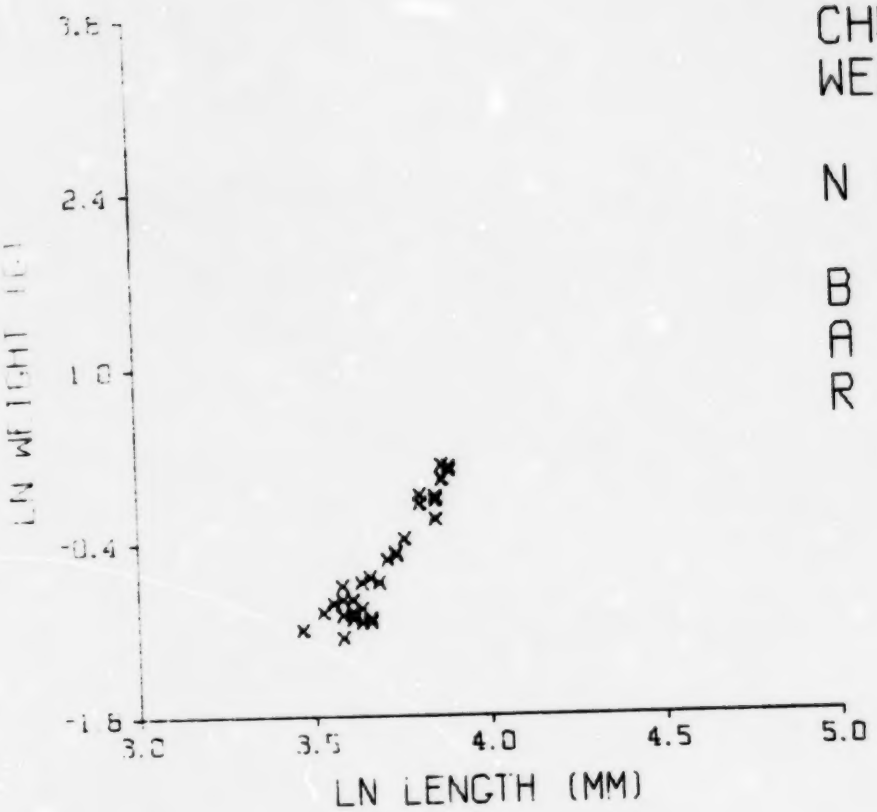

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 30.

Fig. 31-43. Length frequency, and length-weight relationship for chum captured by the 120 fathom purse seine between sampling Weeks 5 (Fig. 31) and 18 (Fig. 43). Dates of sampling weeks as in previous figures.


CHUM T PS
WEEK 5
N = 31
B = 3.50
A =-13.53
R =0.9388
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

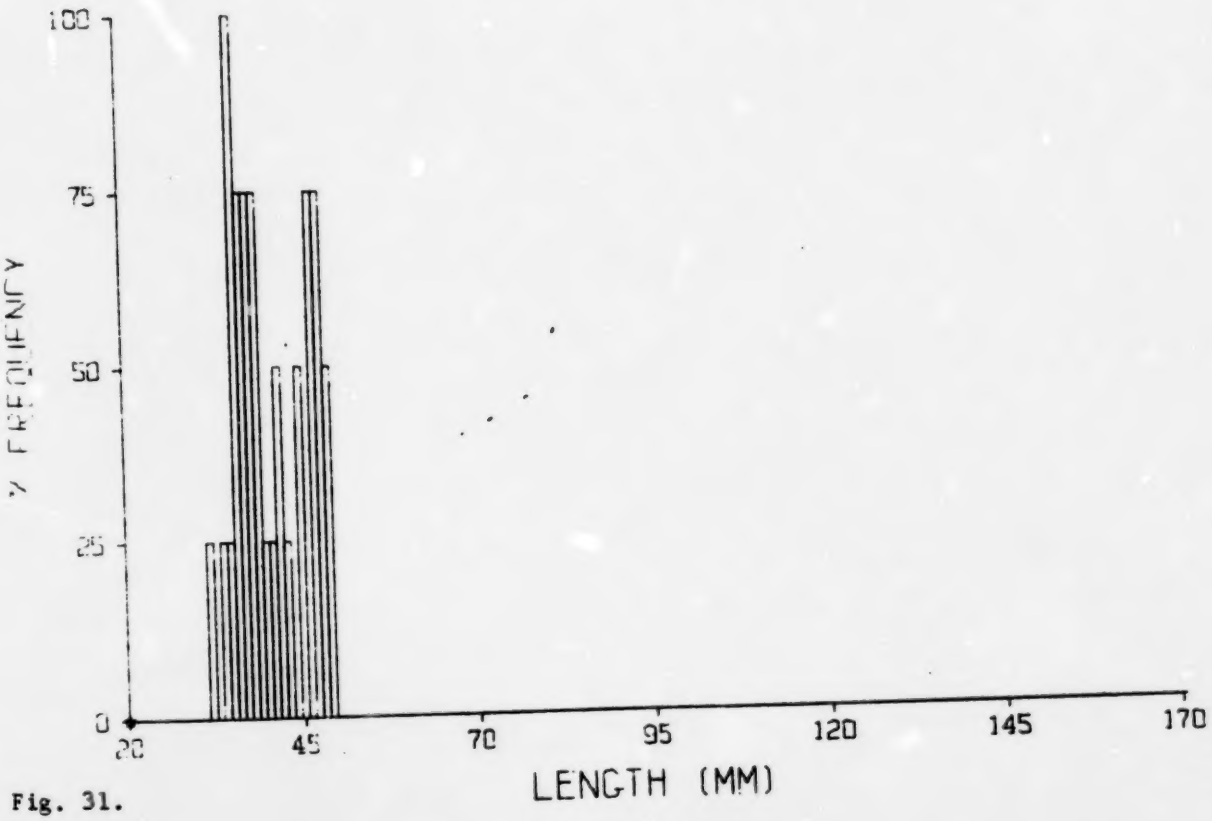
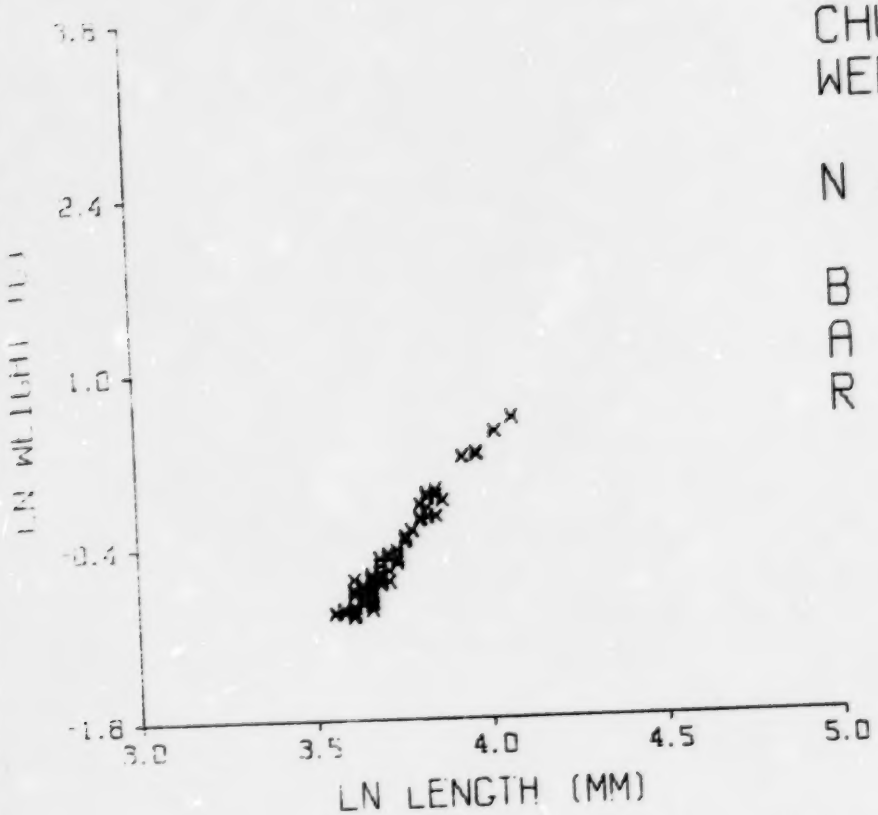

100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 31.


CHUM T PS
WEEK 6
N = 93
B = 3.40
A =-13.16
R =0.9736
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

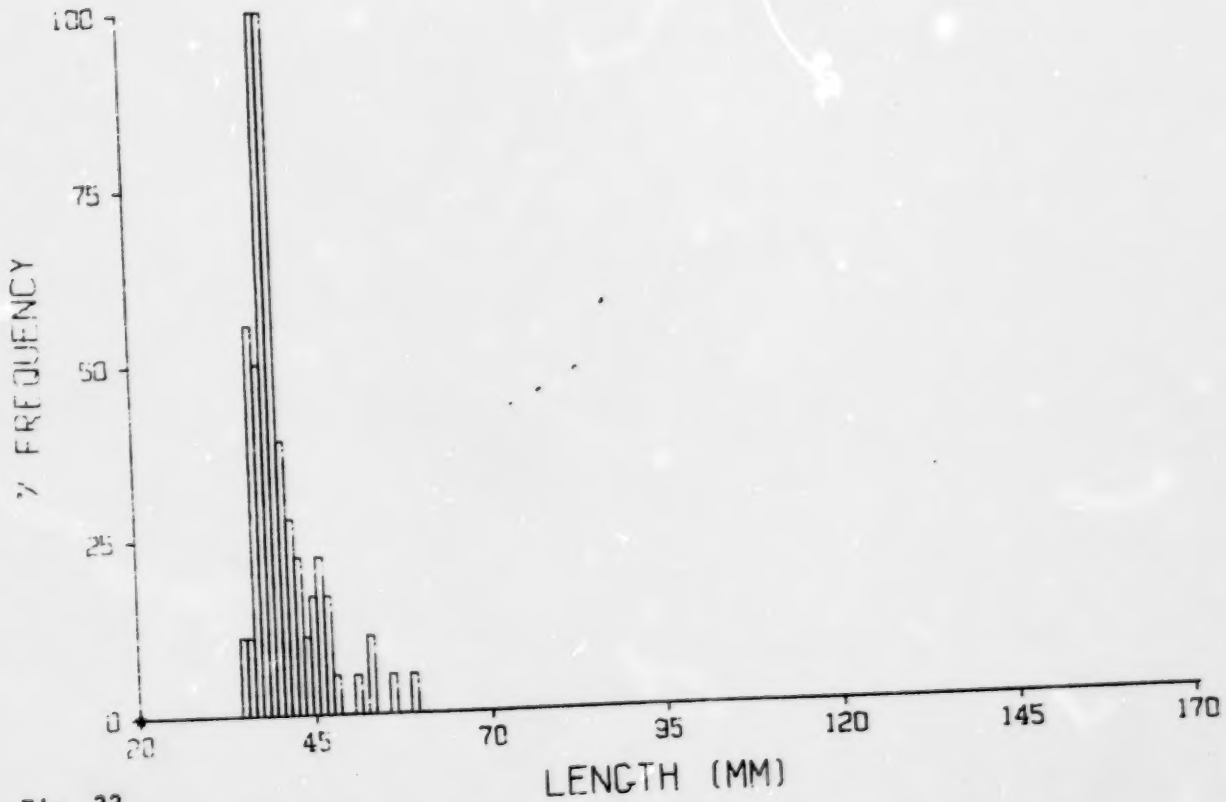
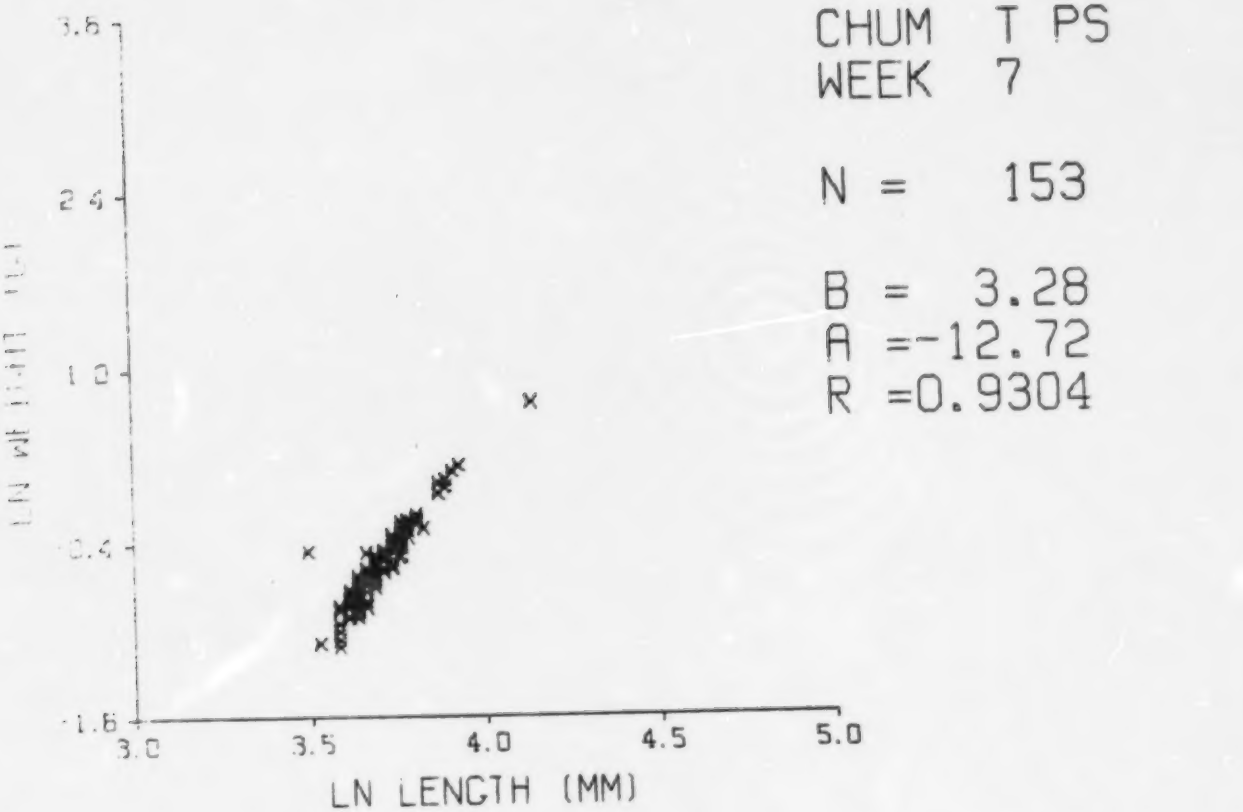

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 32.


CHUM T PS
WEEK 7
N = 153
B = 3.28
A =-12.72
R =0.9304
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

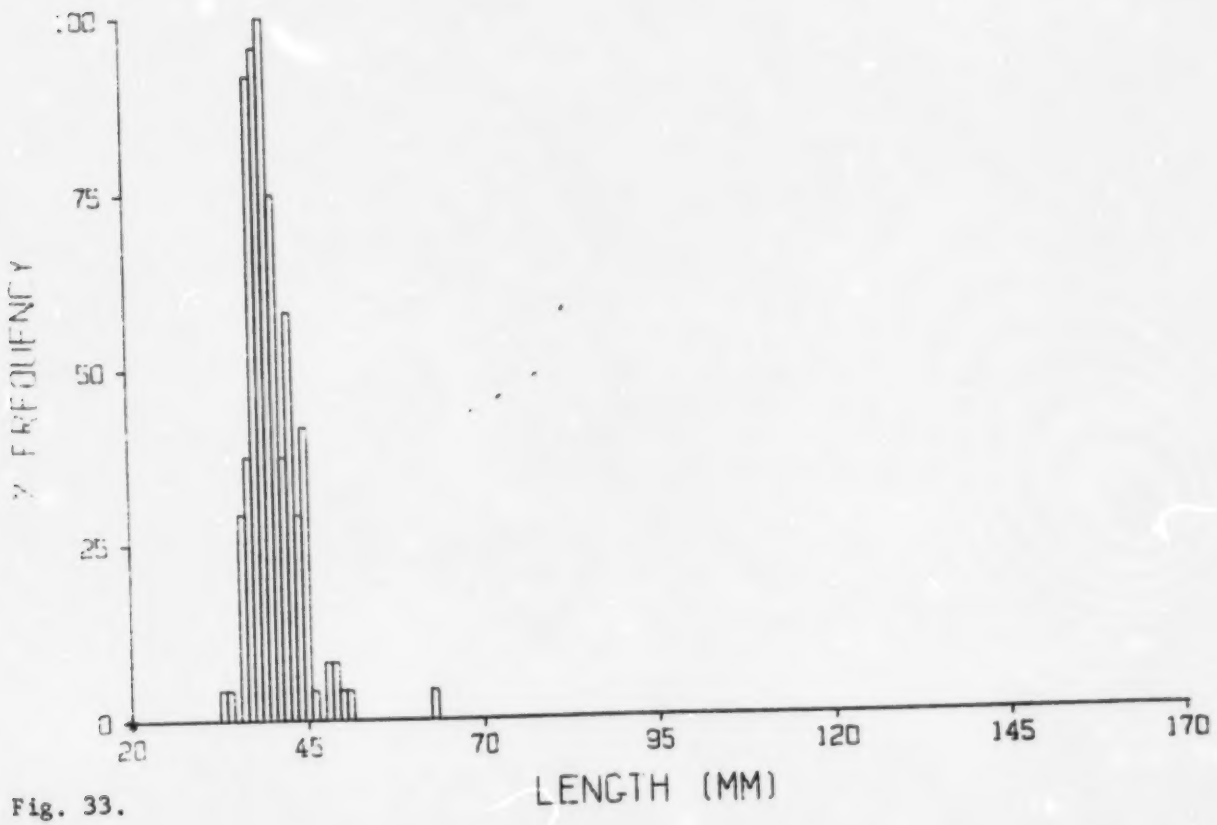
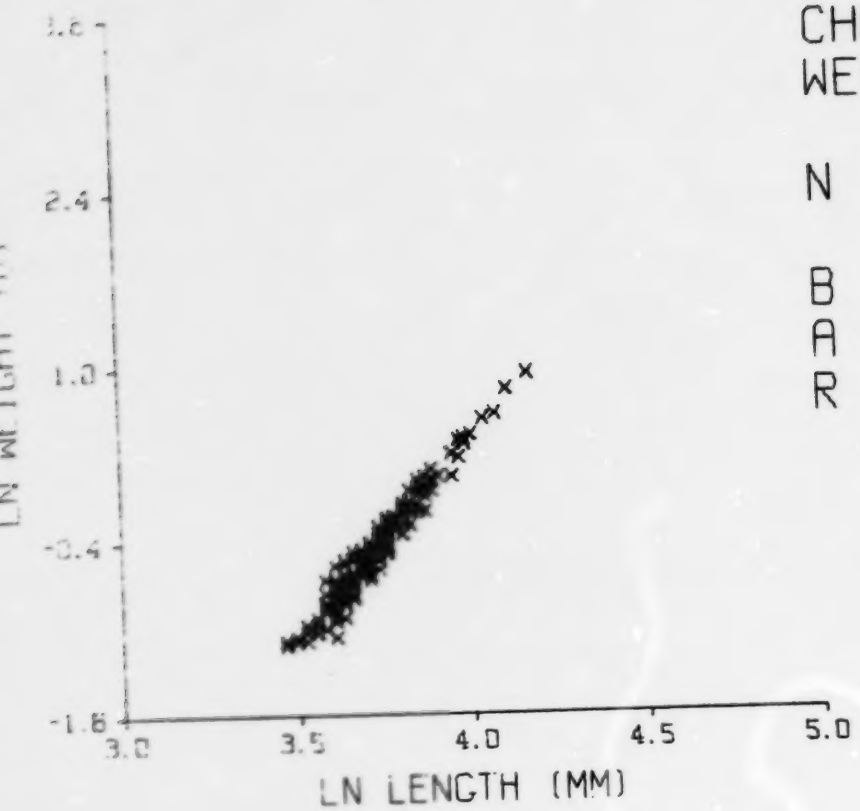

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 33.


CHUM T PS
WEEK 8
N = 250
B = 3.28
A =-12.71
R =0.9748
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

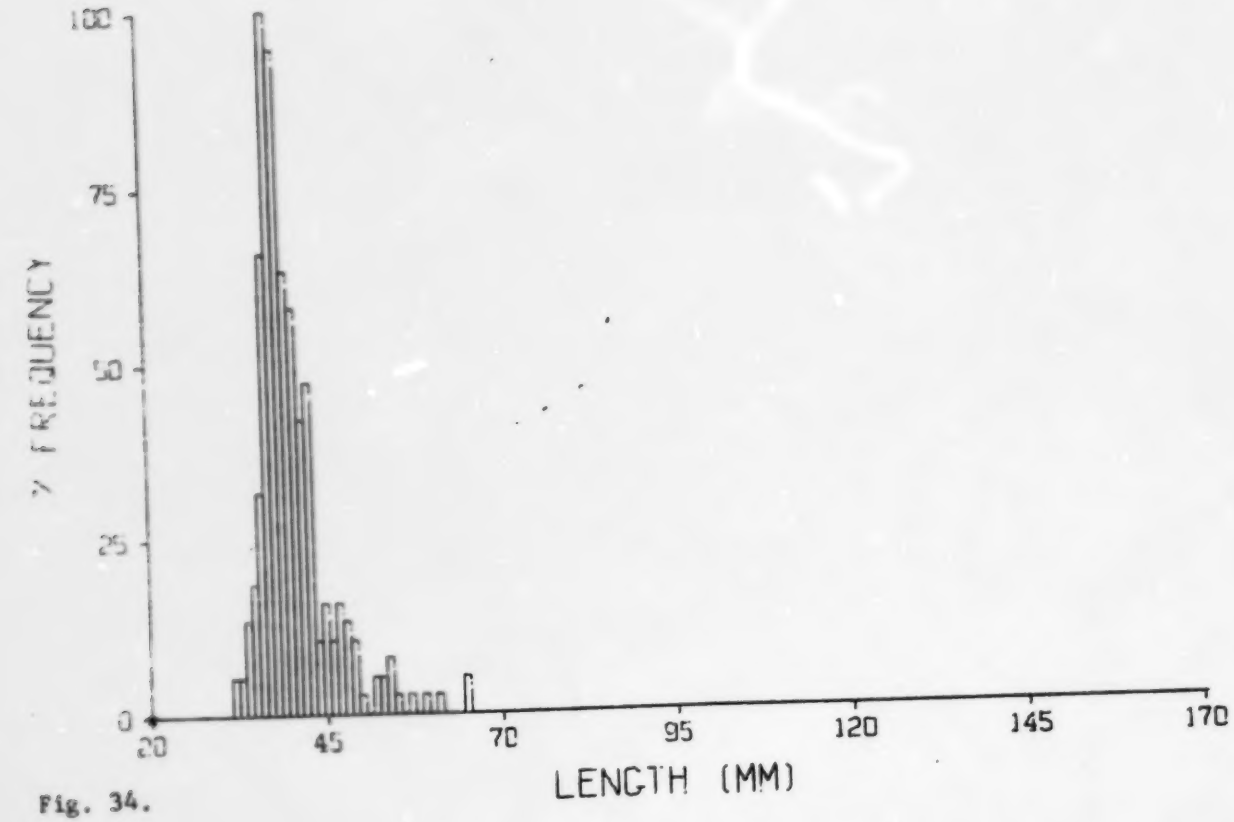
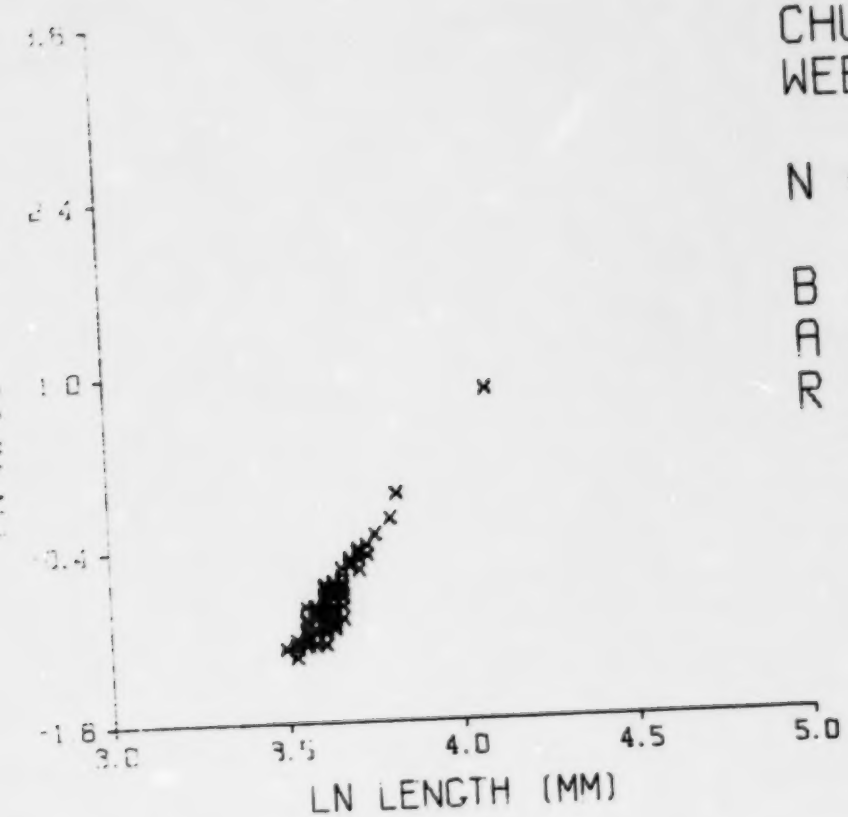

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 34.


CHUM T PS
WEEK 10
N = 142
B = 3.67
A =-14.17
R =0.9252
1.0
-1.6
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

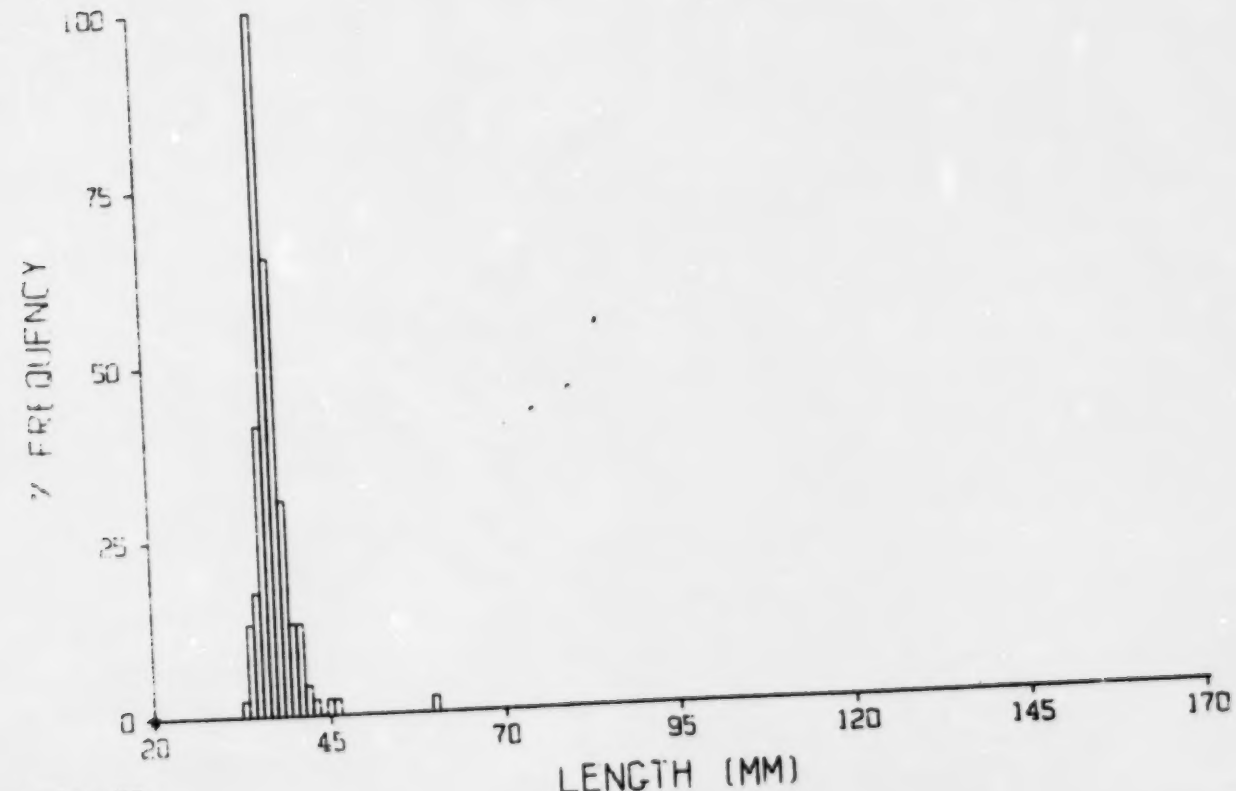
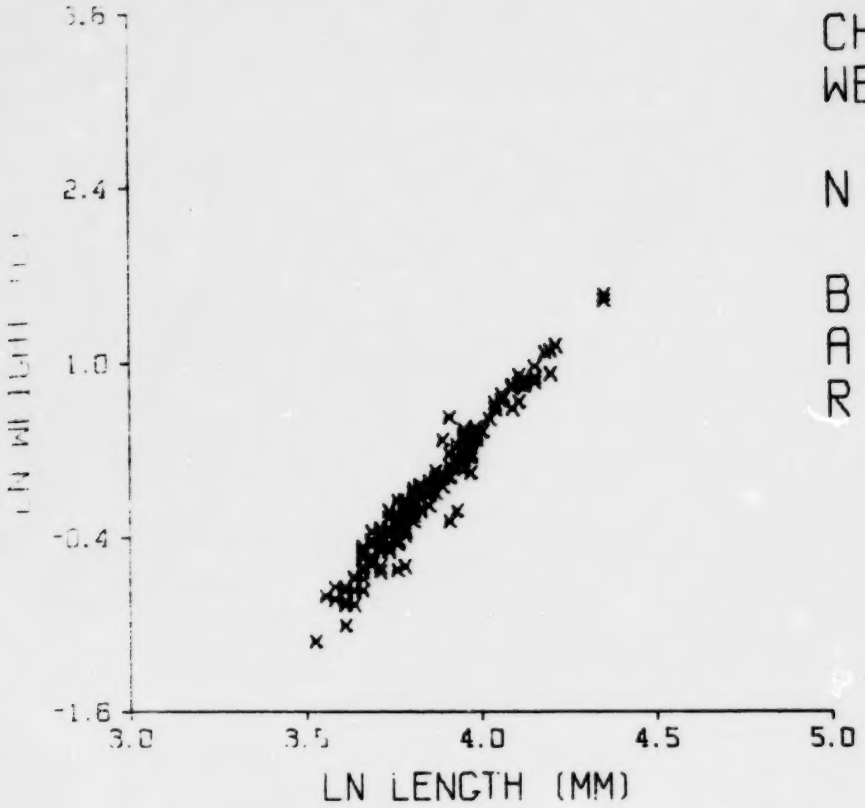

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 35.


CHUM T PS
WEEK 11
N = 209
B = 3.22
A =-12.41
R =0.9758
3.6
2.4
1.0
-0.4
-1.6
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

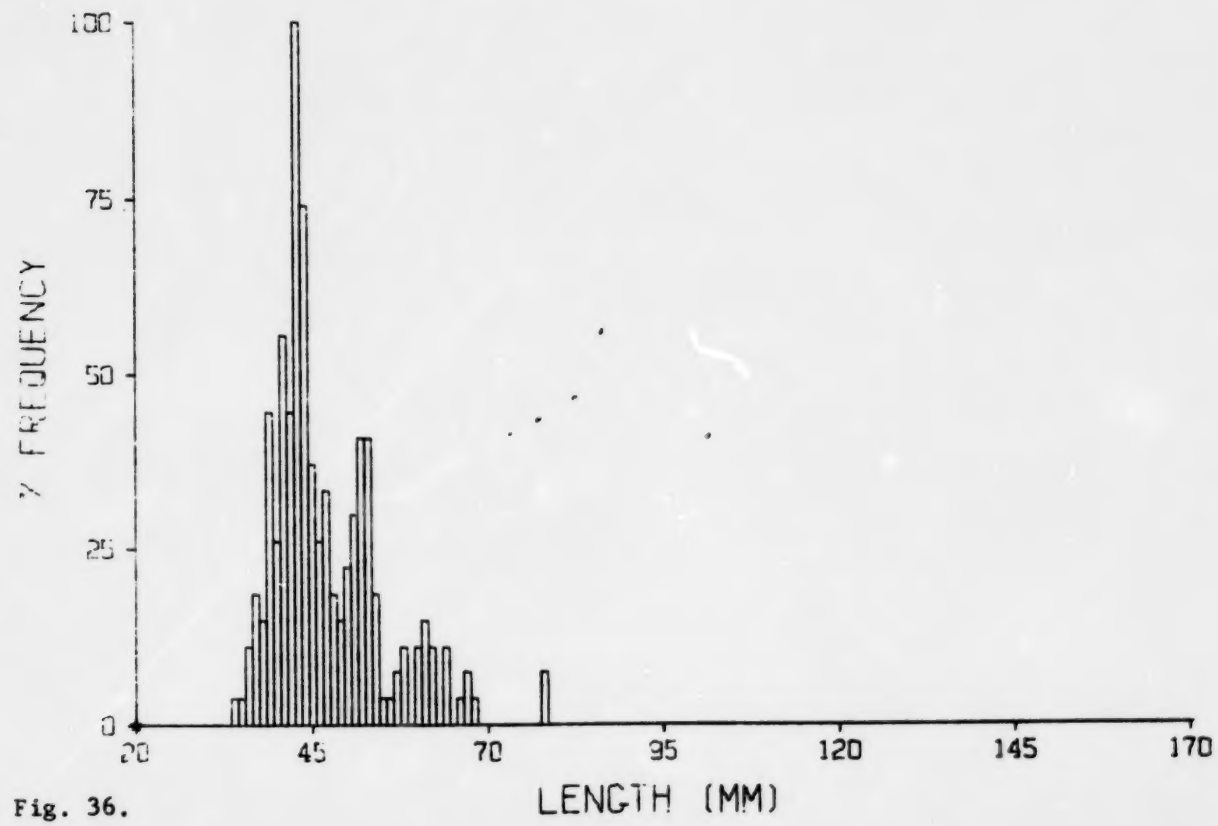
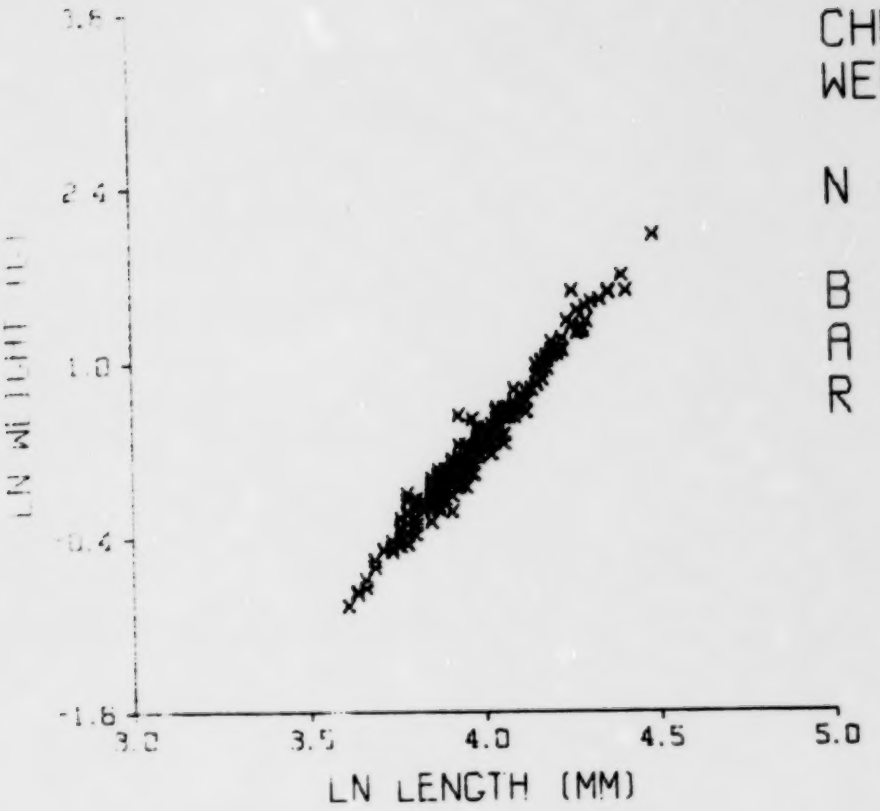

100
75
50
25
0
% FREQUENCY
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 36.


CHUM T PS
WEEK 12
N = 214
B = 3.22
A =-12.48
R =0.9838
LN WEIGHT (G)
LN LENGTH (MM)
3.5
4.0
4.5
5.0

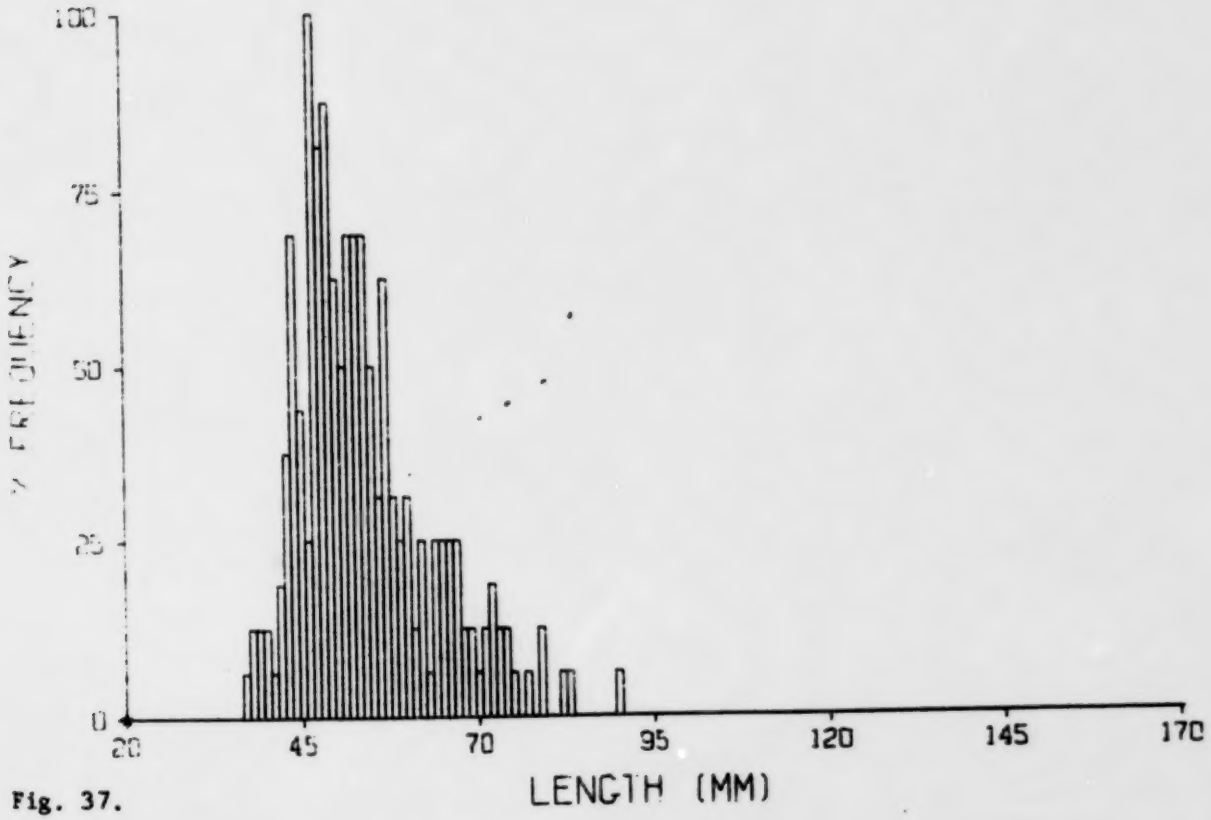
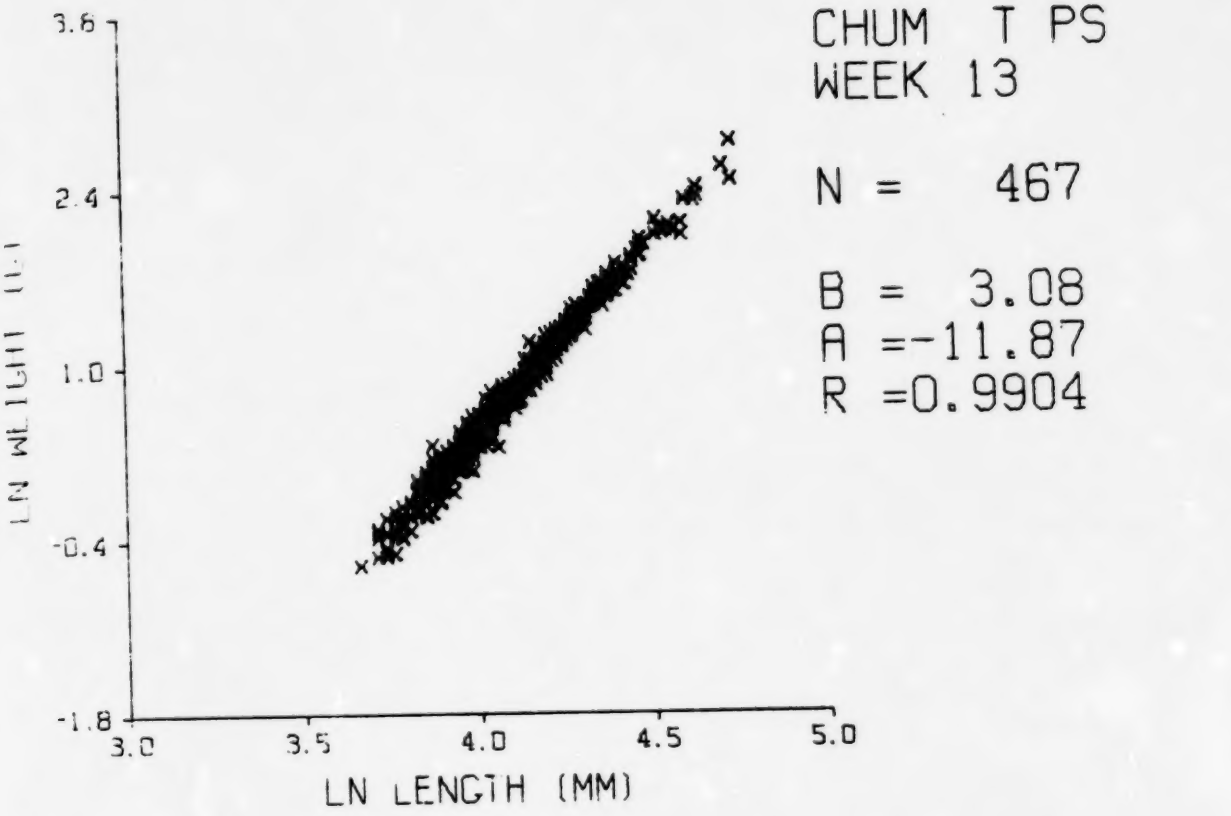

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 37.


CHUM T PS
WEEK 13
N = 467
B = 3.08
A =-11.87
R =0.9904
LN WEIGHT (G)
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

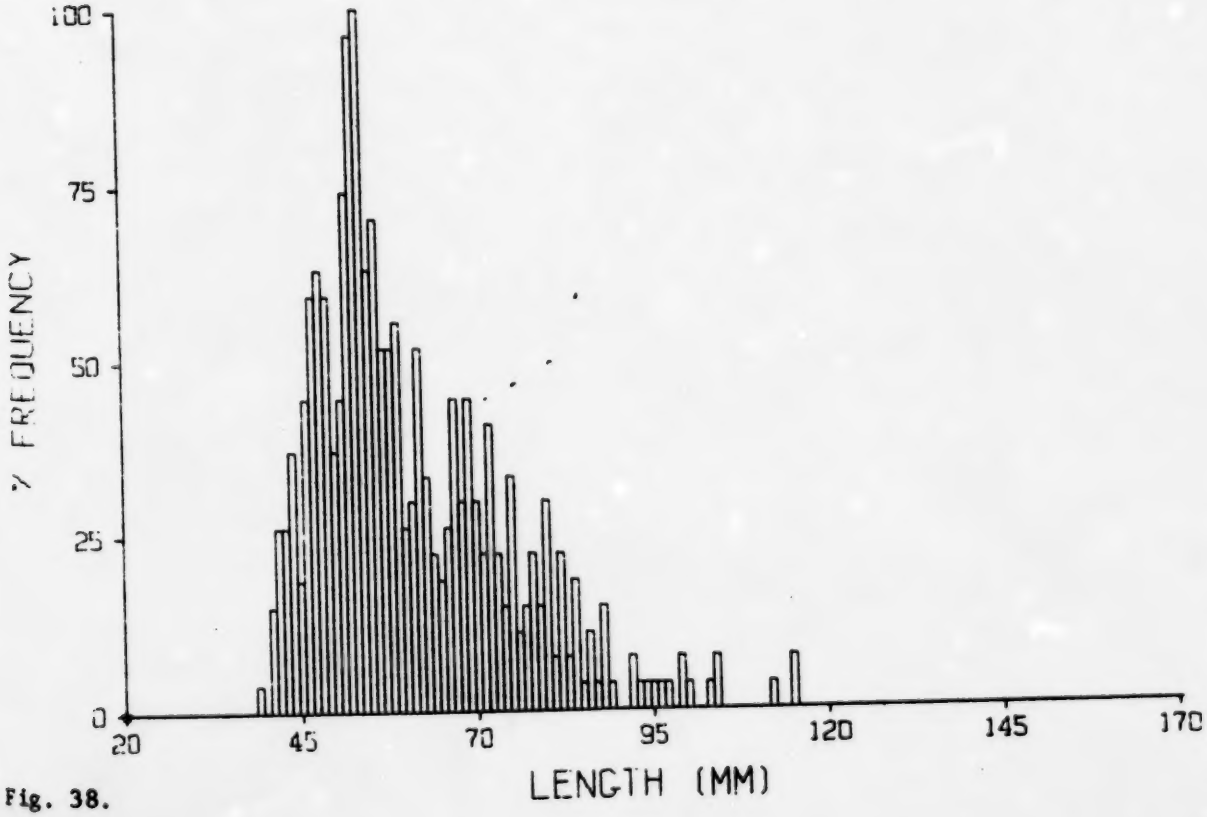
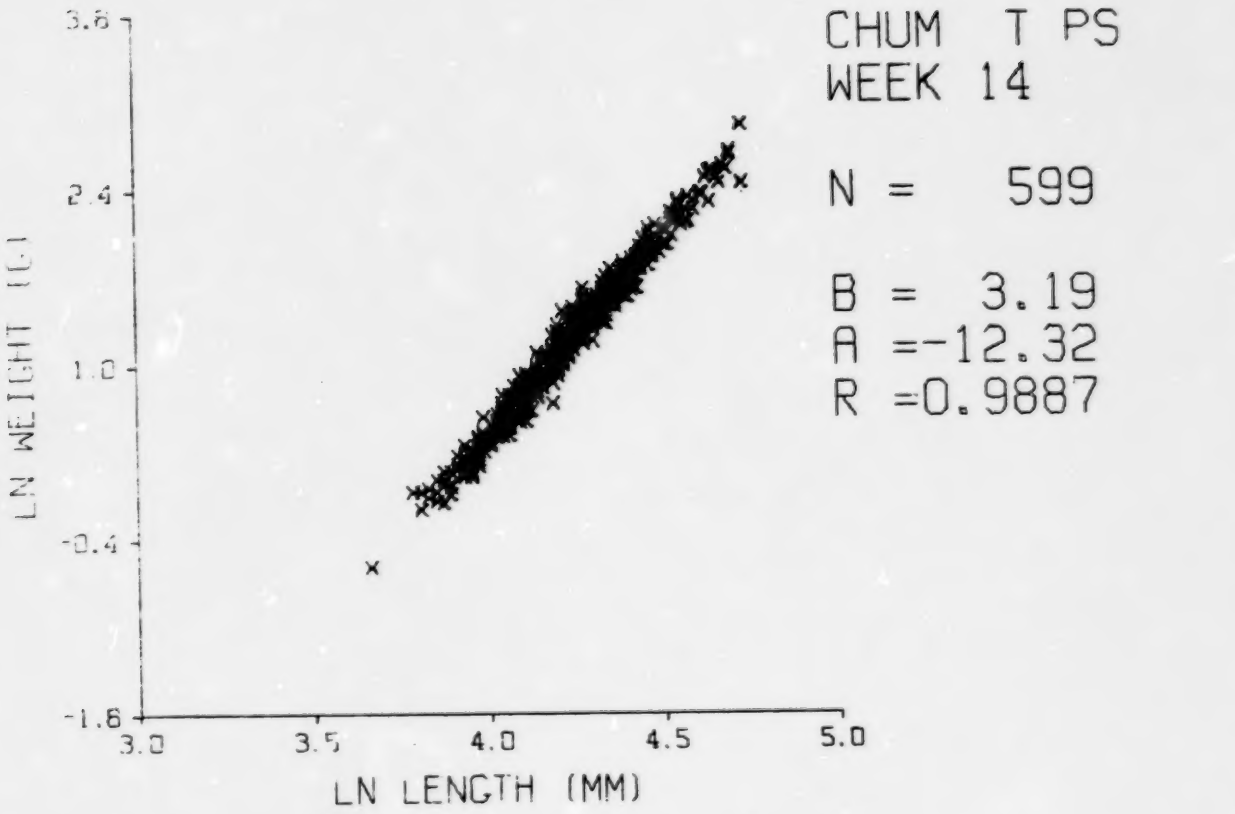

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 38.


CHUM T PS
WEEK 14
N = 599
B = 3.19
A =-12.32
R =0.9887
LN WEIGHT (G)
3.8
2.4
1.0
-0.4
-1.6
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

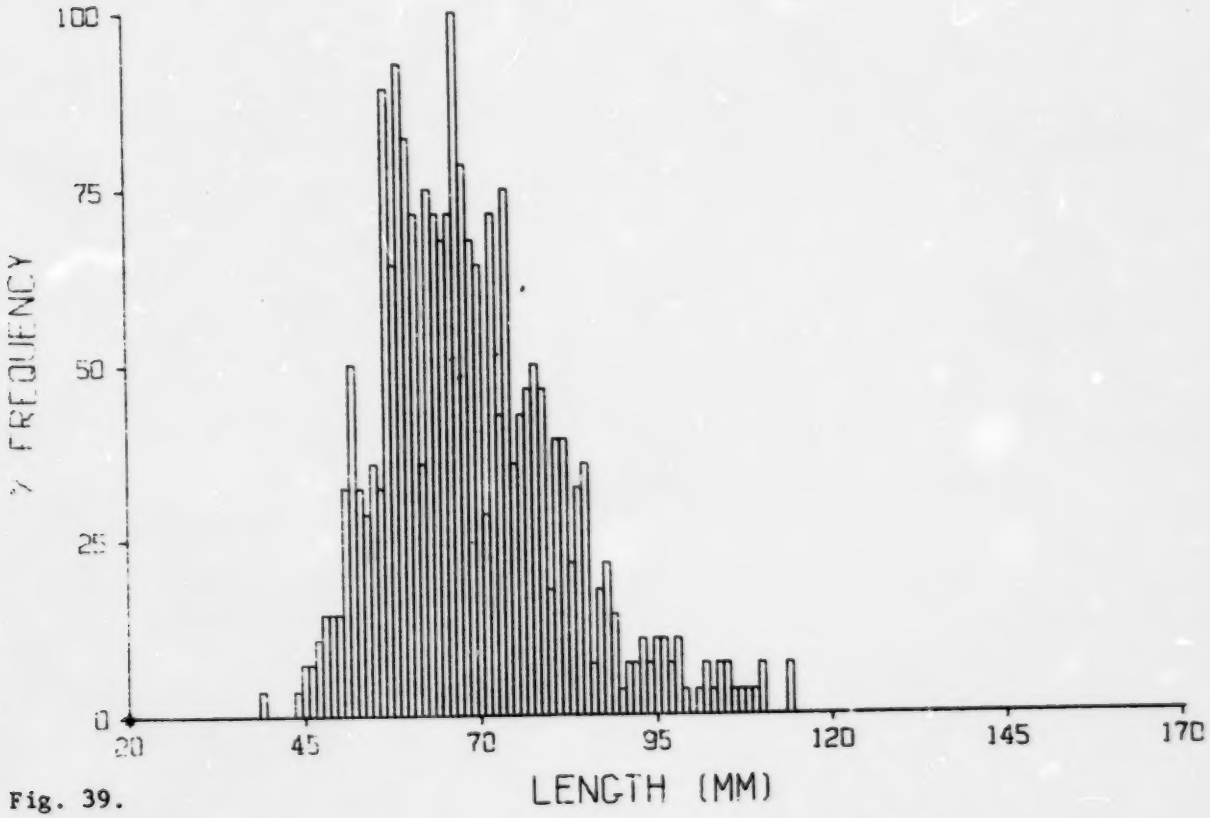
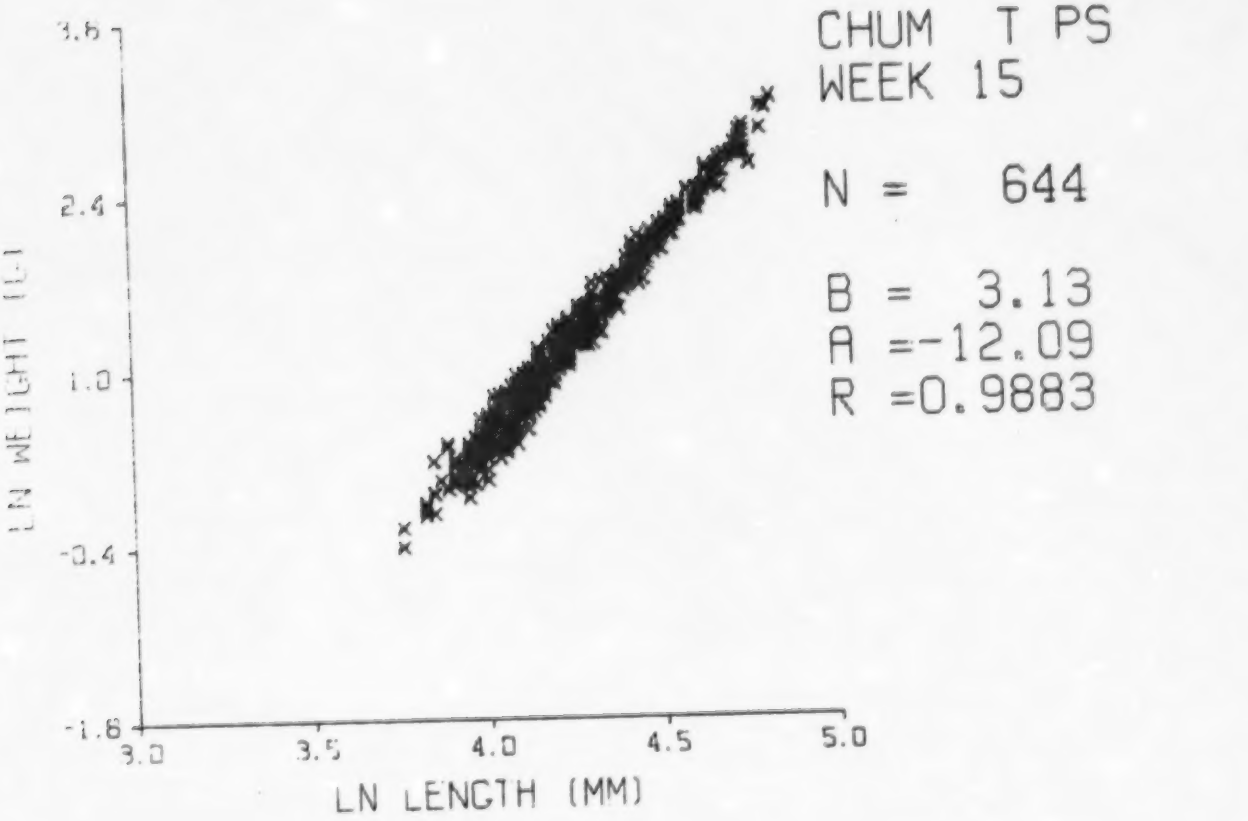

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 39.


CHUM T PS
WEEK 15
N = 644
B = 3.13
A =-12.09
R =0.9883
LN WEIGHT (G)
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

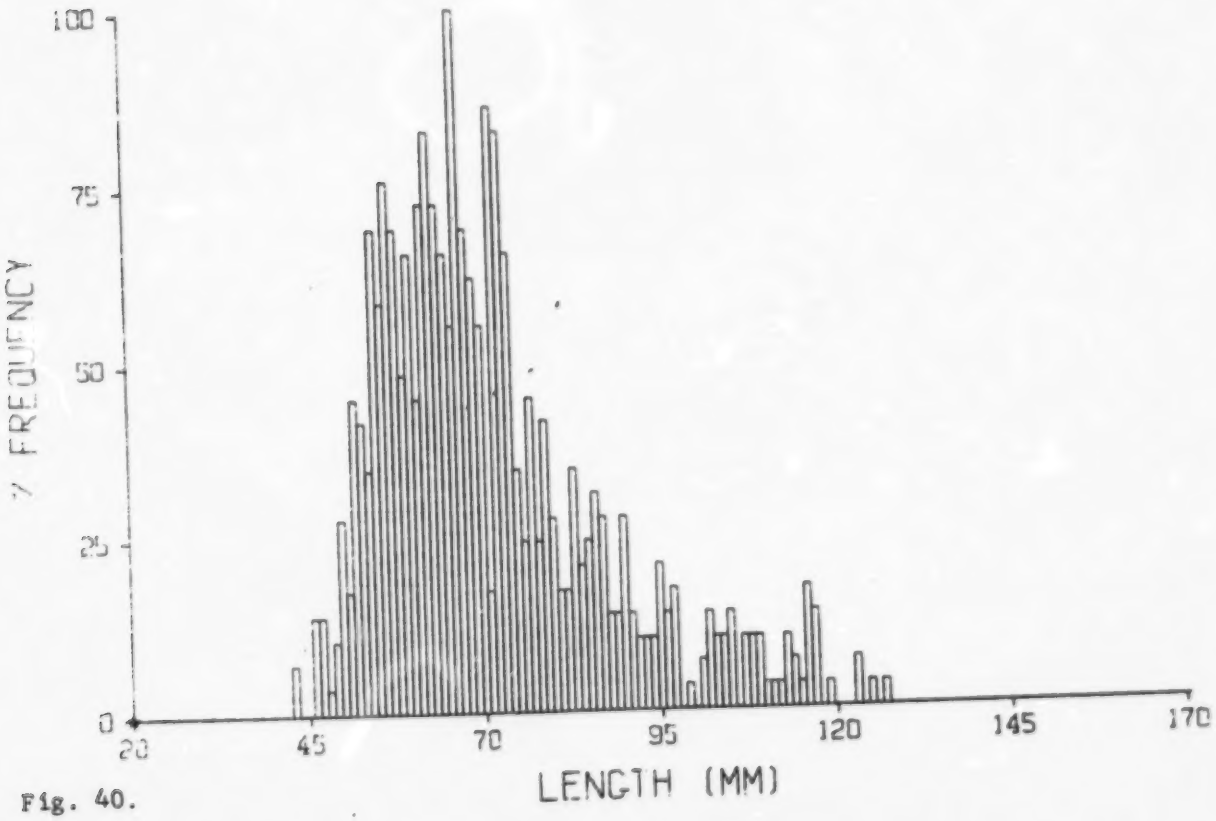
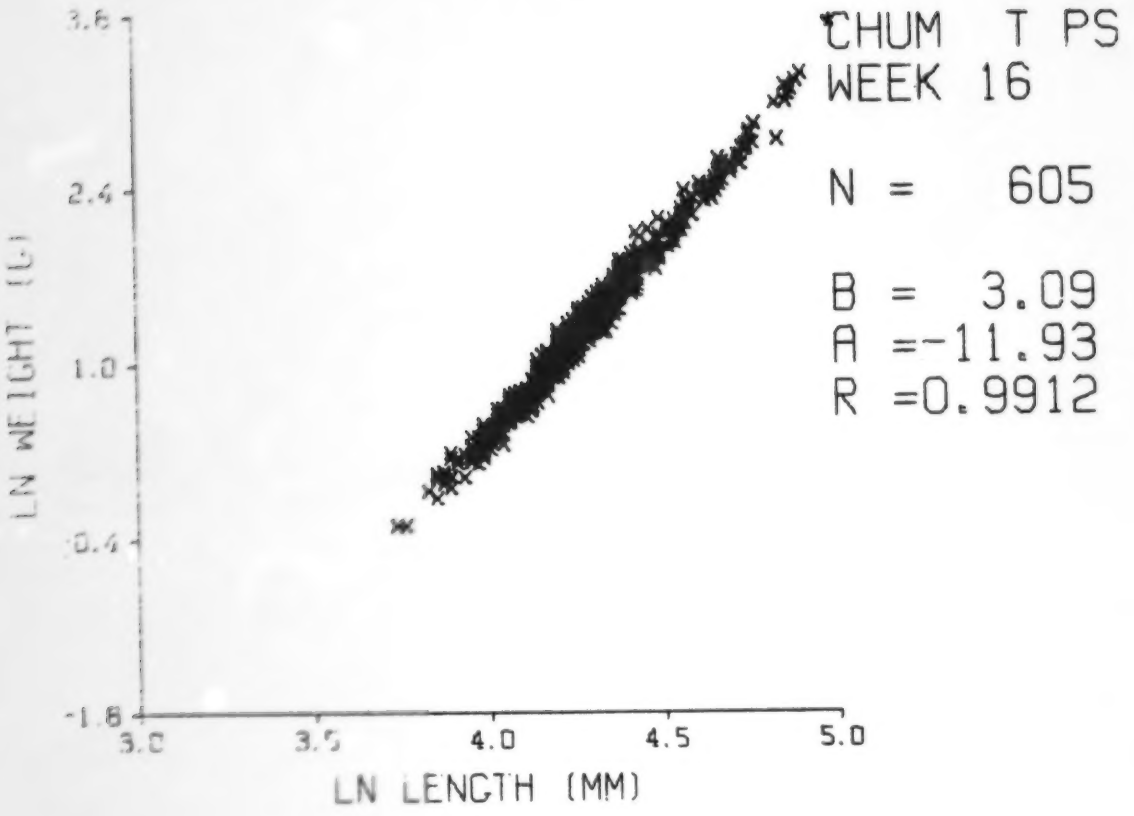

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 40.


CHUM T PS
WEEK 16
N = 605
B = 3.09
A =-11.93
R =0.9912
LN WEIGHT (G)
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

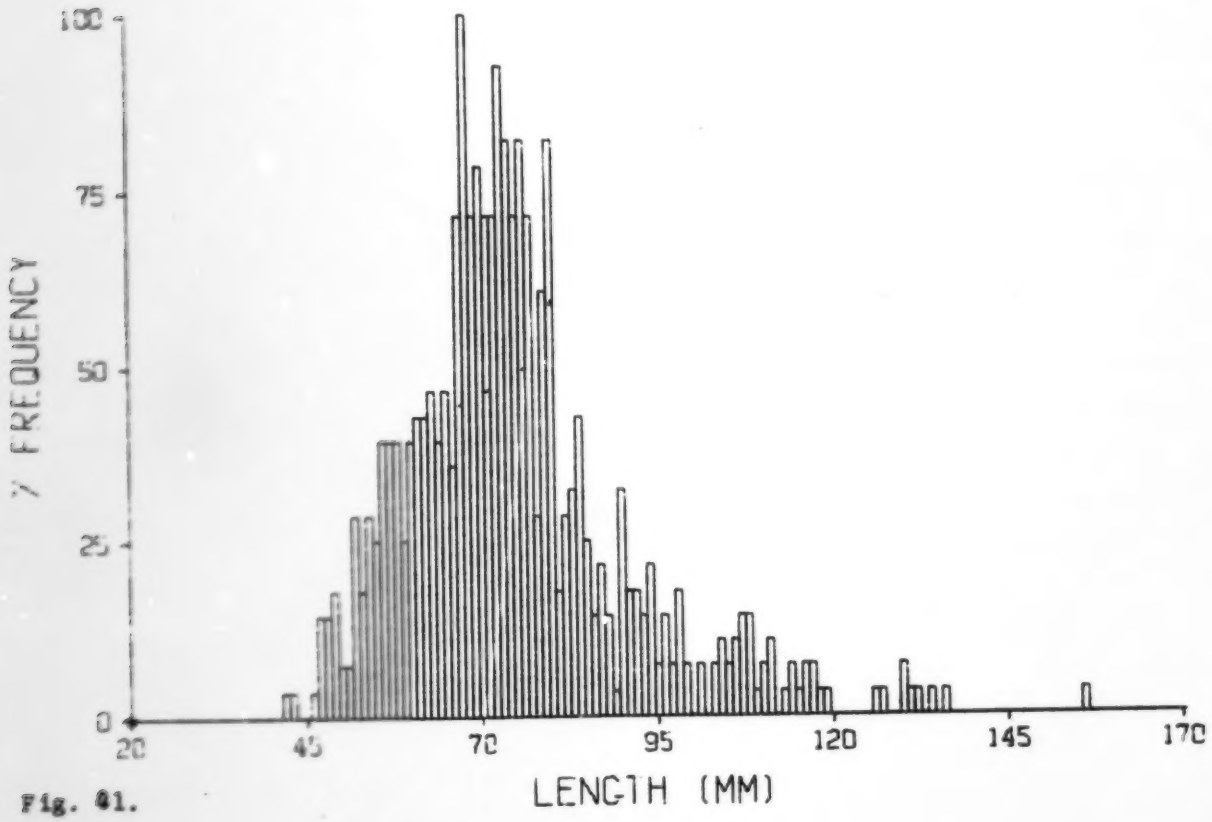
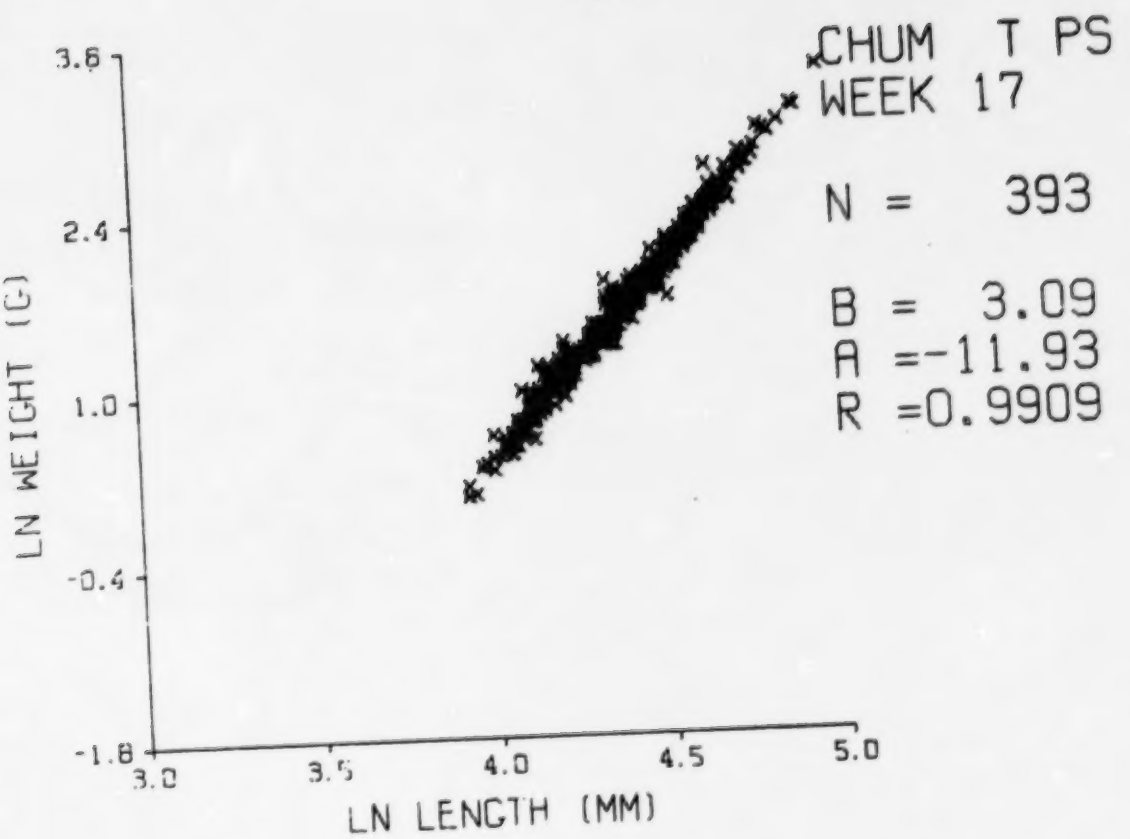

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 41.


CHUM T PS
WEEK 17
N = 393
B = 3.09
A =-11.93
R =0.9909
LN WEIGHT (G)
3.6
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0
LN LENGTH (MM)

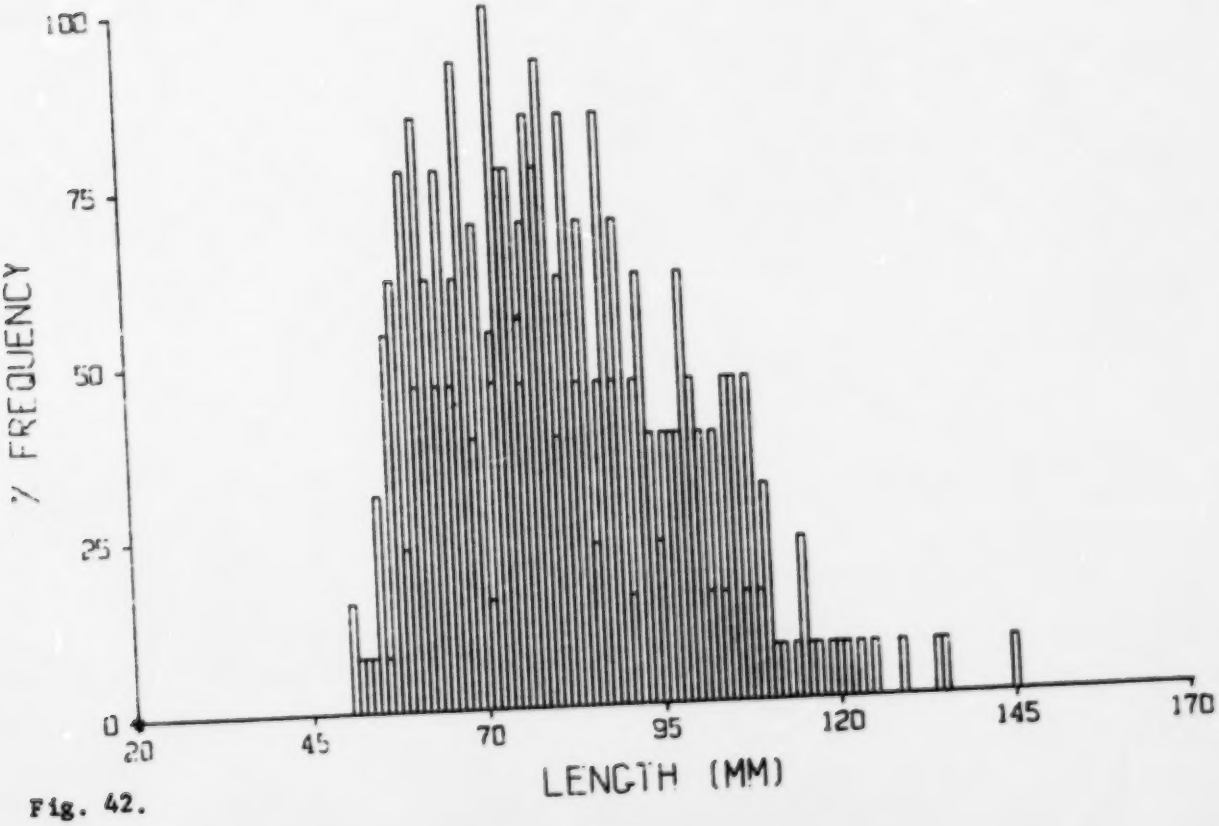
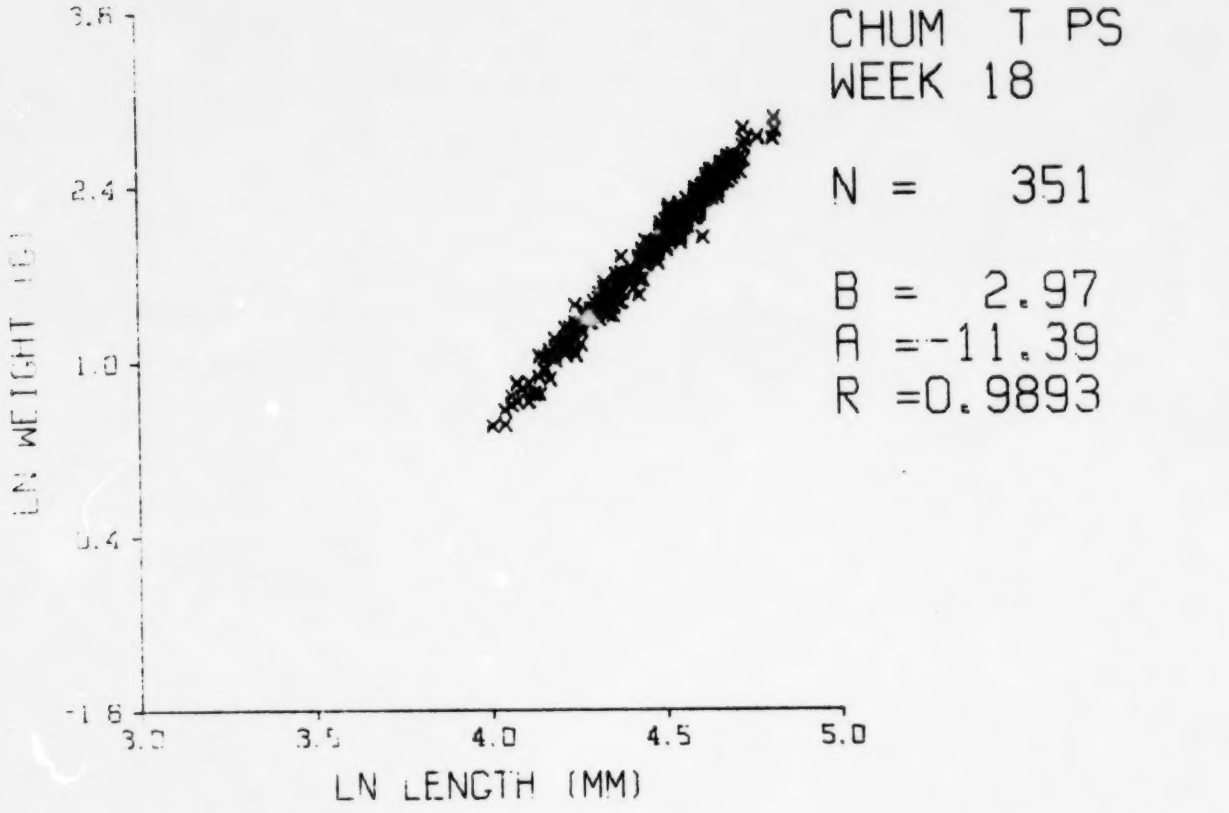

% FREQUENCY
100
75
50
25
0
20
45
70
95
120
145
170
LENGTH (MM)

Fig. 42.


CHUM T PS
WEEK 18
N = 351
B = 2.97
A =-11.39
R =0.9893
LN WEIGHT (G)
LN LENGTH (MM)
3.8
2.4
1.0
-0.4
-1.8
3.0
3.5
4.0
4.5
5.0

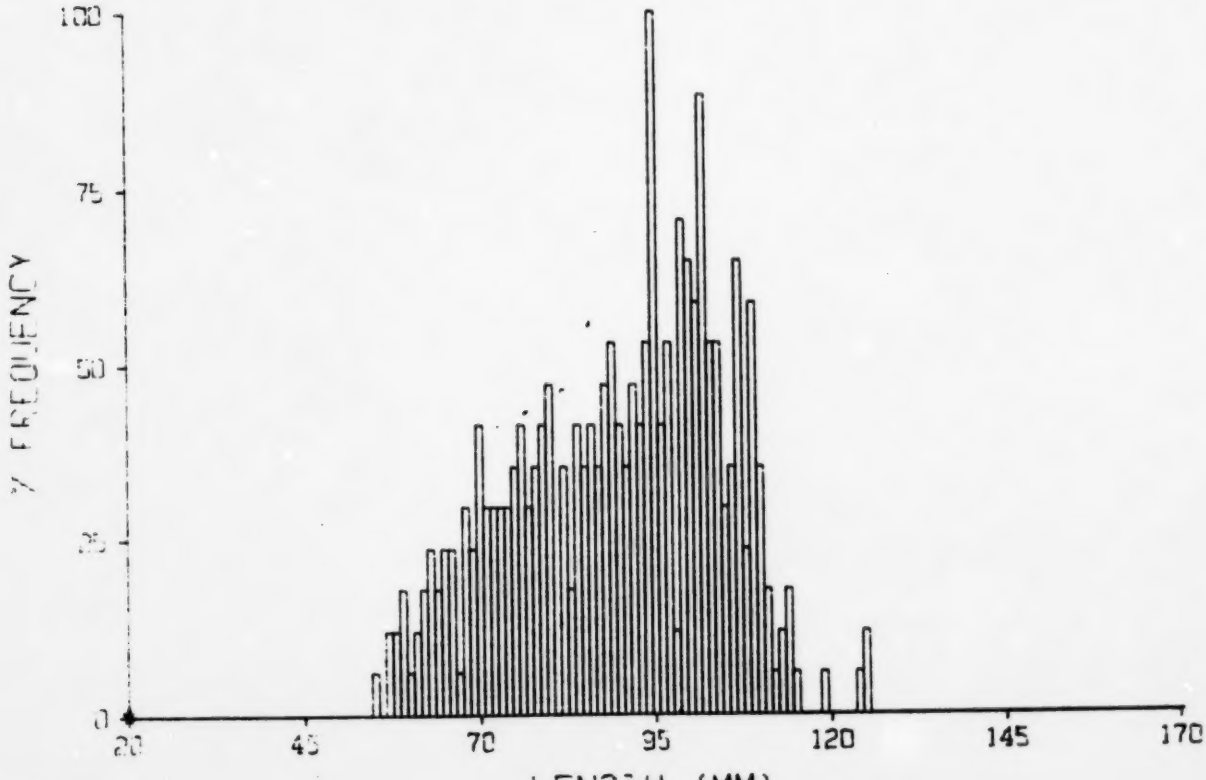

% FREQUENCY
LENGTH (MM)
100
75
50
25
0
20
45
70
95
120
145
170

Fig.43.

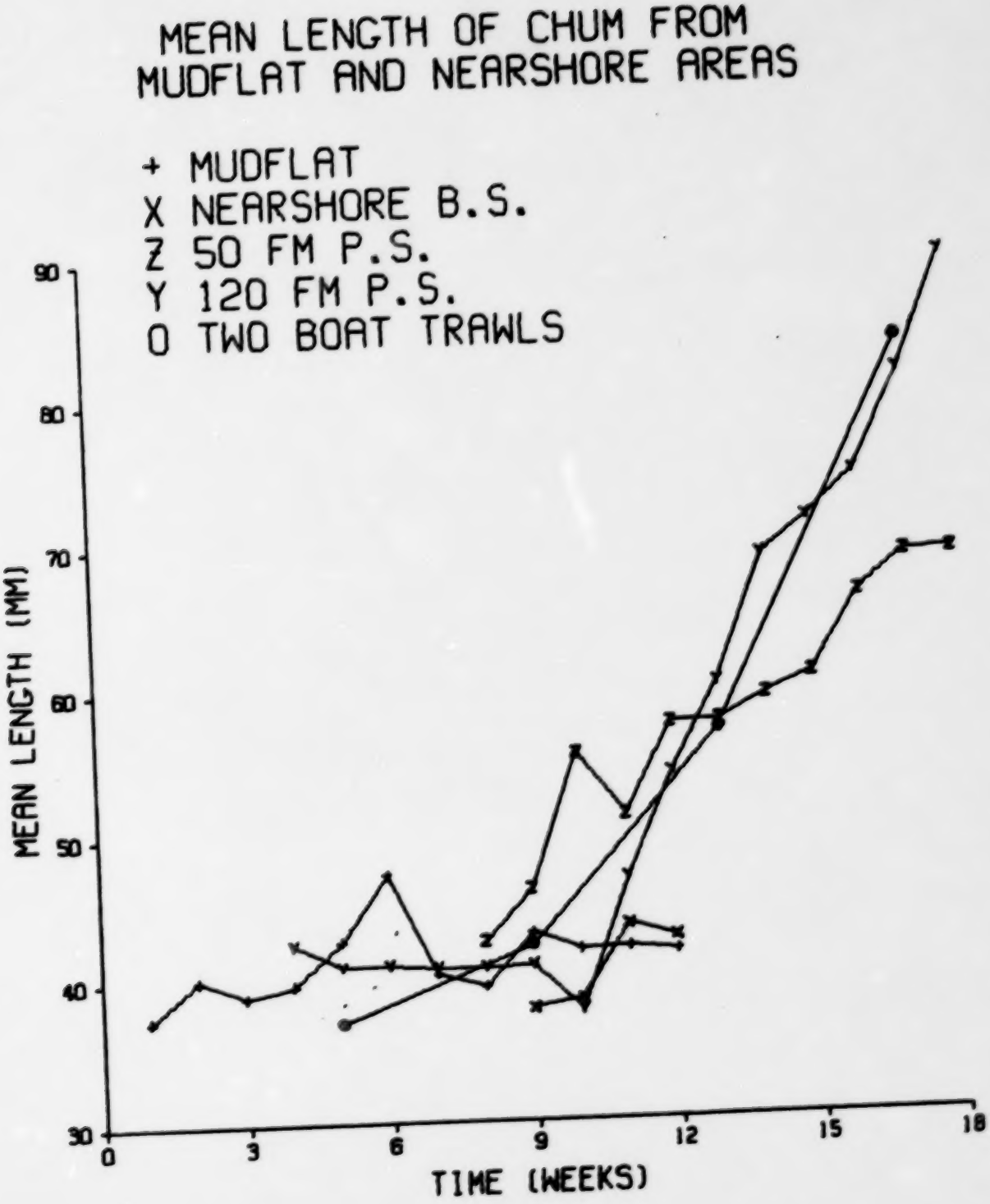


Fig. 44. Comparison of mean lengths of chum captured by different gear types each week.

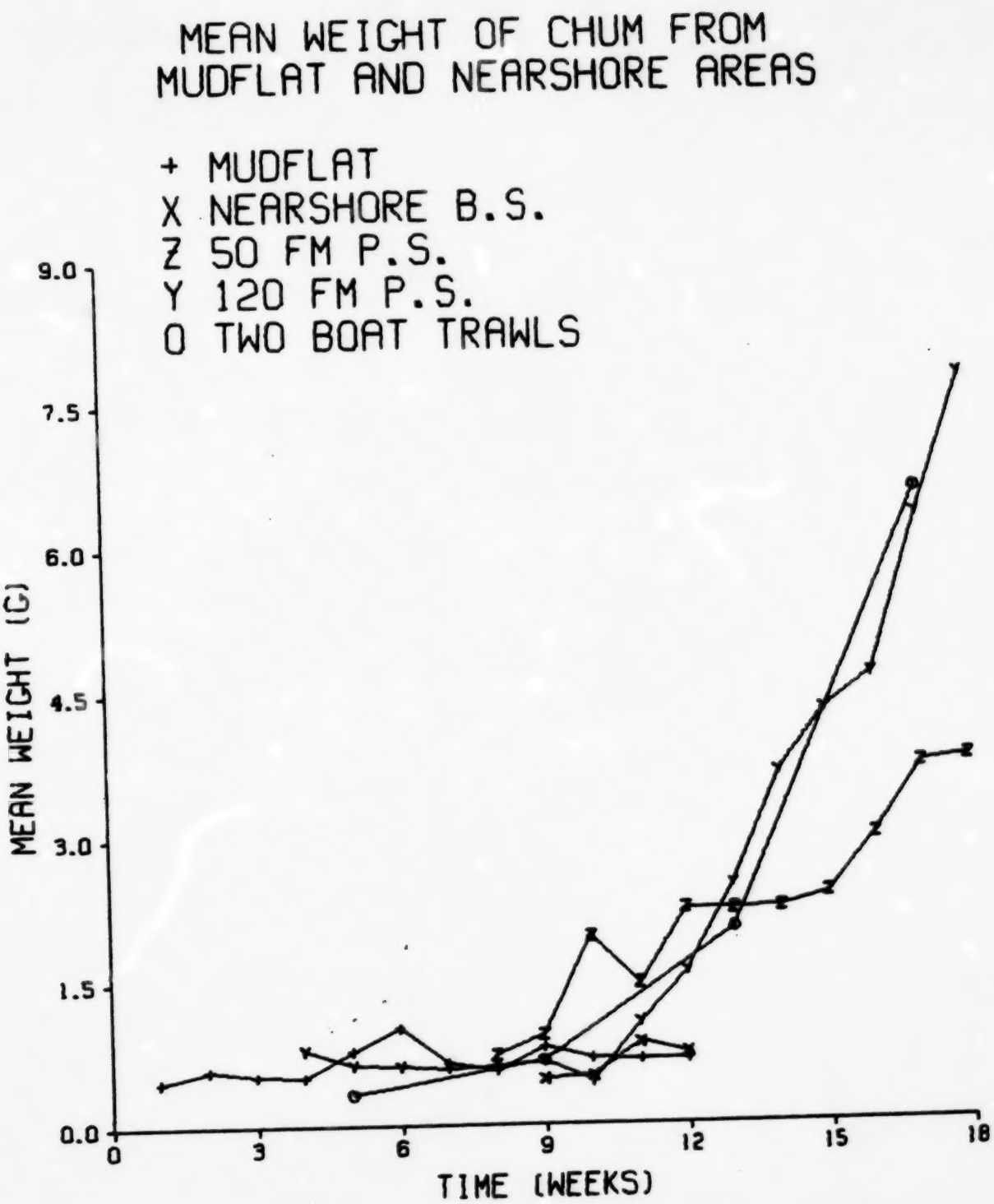


Fig. 45. Comparison of mean weights of chum captured by different gear types each week.

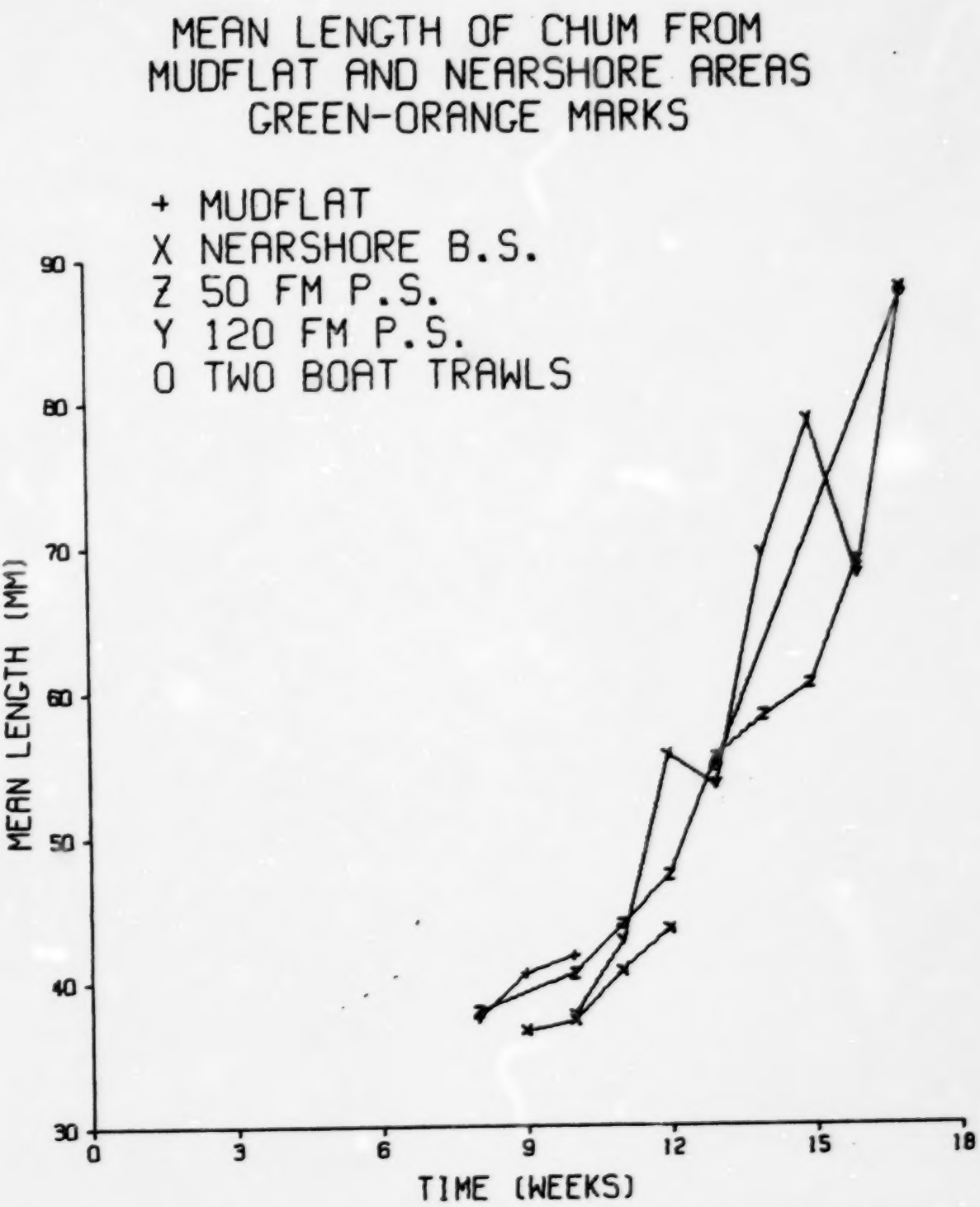


Fig. 46. Comparison of mean length of green/orange marked chum captured by different gear types each week.

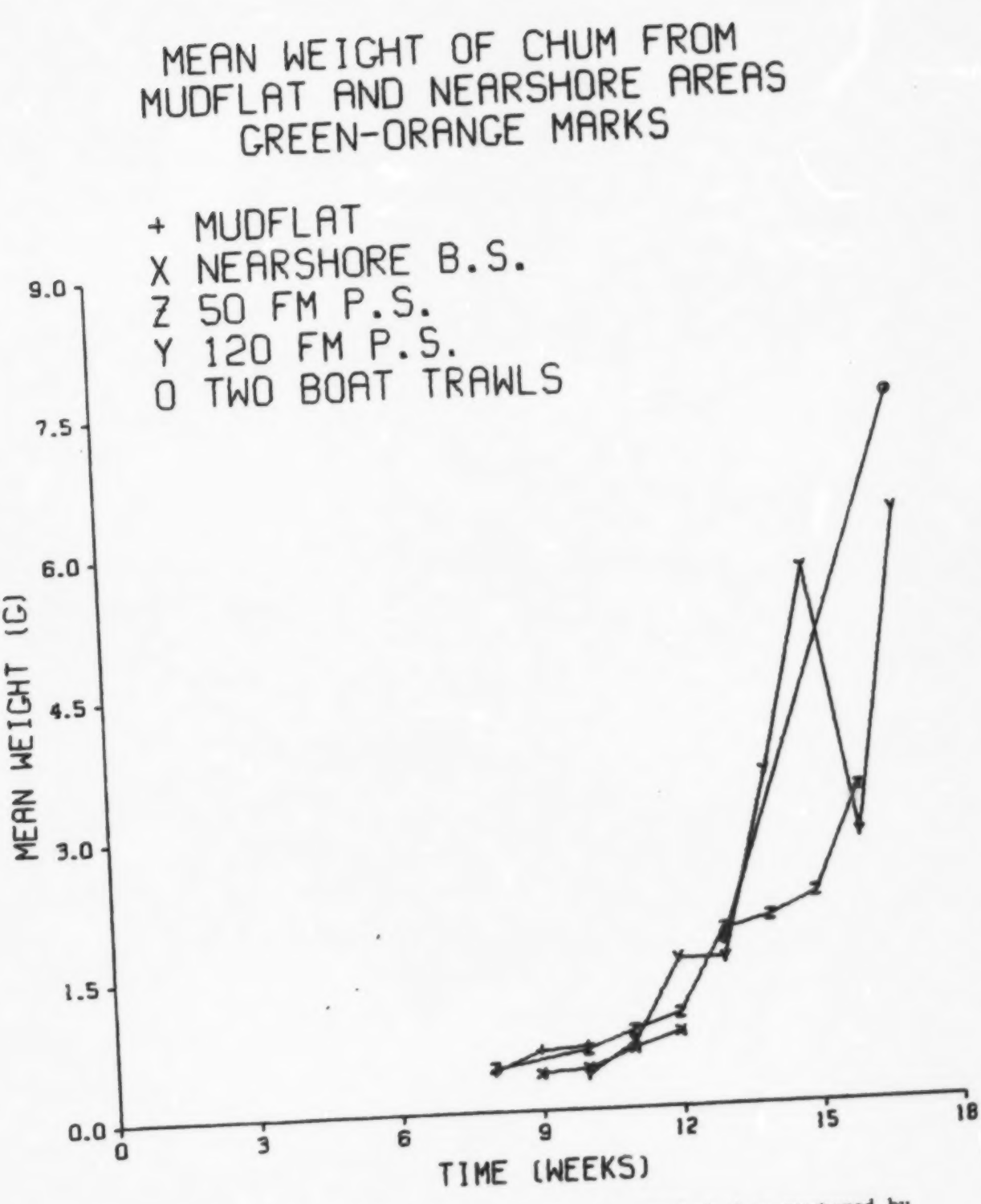


Fig. 47. Comparison of mean weight of green/orange marked chum captured by different gear types each week.